

**Monsanto**

**Phase II Remedial  
Investigation Report  
for the Soda Springs Elemental  
Phosphorus Plant  
Volume IV**

Prepared by:



and



SENES Consultants Limited

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Monsanto  
Phase II  
R.I  
Vol. 4

APPENDIX L-2

MEMORANDUM ON FATE AND TRANSPORT MODELING

AR 2.5

4/1/88

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October 5, 1993

Our ref: 913-1101.608

United States Environmental Protection Agency  
Region X  
1200 Sixth Avenue (HW-113)  
Seattle, Washington 98101

ATTENTION: Mr. Tim Brincefield

RE: PHASE II REMEDIAL INVESTIGATION MEMORANDUM ON FATE AND  
TRANSPORT MODELING, MONSANTO ELEMENTAL PHOSPHOROUS PLANT,  
SODA SPRINGS, IDAHO

Dear Tim:

On behalf of Monsanto, please find the enclosed memorandum concerning the referenced project. A diskette included with the document contains data files and results for modeling. The solute transport computer model also is included on the diskette. If you have any questions concerning this information please contact Bob Geddes or one of the undersigned.

Sincerely,

GOLDER ASSOCIATES INC.

Mark Cunnane, P.E.  
Senior Environmental Engineer

for David Banton  
Associate

MC\DB\ln

Enclosure (w/out diskette)

cc: R. Geddes, Monsanto  
D. Wilson, Monsanto  
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**PHASE II REMEDIAL INVESTIGATION MEMORANDUM  
ON FATE AND TRANSPORT MODELING**

**MONSANTO ELEMENTAL  
PHOSPHOROUS PLANT  
SODA SPRINGS, IDAHO**

**Prepared for:**

**Monsanto Company**

**Prepared by:**

**Golder Associates Inc.  
Redmond, Washington**

**October 6, 1993**

**913-1101.605**

TABLE OF CONTENTS

	<u>Page No.</u>
1. INTRODUCTION	1
2. HYDROGEOLOGIC MODELING METHODS	2
2.1 Groundwater Flow Modeling Method	2
2.2 Solute Transport Modeling Method	3
3. GROUNDWATER FLOW MODELING	7
3.1 Hydrogeologic Conceptual Model	7
3.1.1 Surficial Hydrologic Features	7
3.1.2 Aquifers	9
3.2 FLOWPATH Modeling Input Data	10
3.3 FLOWPATH Modeling Results	12
4. SOLUTE TRANSPORT MODELING	14
4.1 Source Area History	14
4.2 Constituents of Potential Interest	14
4.3 Hydraulic Transport Parameters	15
4.3.1 Groundwater Velocity	15
4.3.2 Dispersivity	16
4.4 Chemical Transport Parameters	16
4.4.1 Source Concentration	16
4.4.2 Retardation Parameters	18
4.5 Modeling Results	20
5. INTERPRETATIONS	22
5.1 Groundwater Flow Modeling	22
5.2 Solute Transport Modeling	22
6. REFERENCES	24

LIST OF TABLES

4-1	Dispersivity Parameter Values for Solute Transport Modeling
4-2	Parameter Values Used to Determine Source Concentration
4-3	Retardation Parameters
5-1	Comparison Between Predicted and Observed Concentrations

TABLE OF CONTENTS (cont.)LIST OF FIGURES

Figure 1-1	Location Map
Figure 1-2	Location of the Old Underflow Solids Ponds
Figure 2-1	Hypothetical Source Concentration Time History
Figure 3-1	Groundwater Flow Model Area
Figure 3-2	Groundwater Flow Model Hydraulic Conductivity Distribution
Figure 3-3	Groundwater Flow Boundary Conditions
Figure 3-4	Predicted Groundwater Elevation
Figure 3-5	Predicted Groundwater Velocity
Figure 3-6	Predicted Groundwater Pathlines
Figure 3-7	Blackfoot Lava Field Shallow Basalt Aquifer Groundwater Elevation
Figure 4-1	Location of Wells and Springs in the Upper Basalt Zone
Figure 4-2	Scale Dependency of Dispersivity
Figure 4-3	Aluminum Time History Test Well 37
Figure 4-4	Arsenic Time History Test Well 37
Figure 4-5	Cadmium Time History Test Well 37
Figure 4-6	Chloride Time History Test Well 37
Figure 4-7	Fluoride Time History Test Well 37
Figure 4-8	Manganese Time History Test Well 37
Figure 4-9	Molybdenum Time History Test Well 37
Figure 4-10	Nickel Time History Test Well 37
Figure 4-11	Nitrate Time History Test Well 37
Figure 4-12	Selenium Time History Test Well 37
Figure 4-13	Sulfate Time History Test Well 37
Figure 4-14	Vanadium Time History Test Well 37
Figure 4-15	Zinc Time History Test Well 37
Figure 4-16	Predicted Aluminum Concentrations in Groundwater
Figure 4-17	Predicted Arsenic Concentrations in Groundwater
Figure 4-18	Predicted Cadmium Concentrations in Groundwater
Figure 4-19	Predicted Chloride Concentrations in Groundwater
Figure 4-20	Predicted Fluoride Concentrations in Groundwater
Figure 4-21	Predicted Manganese Concentrations in Groundwater
Figure 4-22	Predicted Molybdenum Concentrations in Groundwater
Figure 4-23	Predicted Nickel Concentrations in Groundwater
Figure 4-24	Predicted Nitrate Concentrations in Groundwater
Figure 4-25	Predicted Selenium Concentrations in Groundwater
Figure 4-26	Predicted Sulfate Concentrations in Groundwater
Figure 4-27	Predicted Vandadium Concentrations in Groundwater
Figure 4-28	Predicted Zinc Concentrations in Groundwater
Figure 4-29	Predicted Cadmium Concentrations with Otavite Solubility Control
Figure 4-30	Predicted Fluoride Concentrations with Fluorite Solubility Control After 1984

TABLE OF CONTENTS (Cont.)

LIST OF APPENDICES

Appendix A	Listing of Transport Model Computer Program
Appendix B	Listing of FLOWPATH Groundwater Model Input
Appendix C	Listing of Source Concentrations
Appendix D	Listing of Transport Model Input

## 1. INTRODUCTION

This memorandum addresses one component of an ongoing remedial investigation (RI) and feasibility study (FS) related to the Monsanto Company elemental phosphorous plant in Soda Springs, Idaho (Figure 1-1). Information presented in this memorandum will be integrated into the Phase II RI report and presented to the United States Environmental Protection Agency (EPA) at a later date. The memorandum has been prepared for interim review with the intentions of facilitating characterization of the site conditions as part of the Phase II RI.

Documentation of earlier investigations for the elemental phosphorous plant exists in several reports. The Preliminary Site Characterization Summary Report (PSCSR), consisting of a summary of Phase I RI activities, was submitted to EPA for review in April, 1992 (Golder, 1992a). The Remedial Alternatives Development and Preliminary Screening of Candidate Technologies Memorandum (RAD/PSCTM), consisting of a summary of the Phase I FS, was submitted to EPA in June, 1992 (Golder, 1992b). A Phase II RI work plan (Golder, 1992c) was subsequently developed based on the PSCSR, and the data needs identified in the RAD/PSCTM. The Phase II RI scope of work, detailed in the work plan was approved by EPA in January, 1993.

Following approval of the Phase II RI work plan, field investigations and technical analyses were completed and subsequently documented in several memorandums. These memorandums present results of a geophysical survey (Golder, 1992d), of analyses of geochemistry and hydrology of source areas and the vadose zone (Golder, 1993a), of hydrogeological investigations (Golder, 1993b), and of surficial soil and stream sediment investigations (Golder, 1993c).

This memorandum specifically addresses Phase II RI work plan Activity 4f - Groundwater Modeling. The purpose of this activity is to develop a groundwater flow and solute transport model to evaluate the fate and transport of constituents of potential interest entering groundwater from the area of the old underflow solids ponds. Figure 1-2 shows the location of the old underflow solids ponds and the direction of groundwater flow below the Monsanto plant in the UBZ-2 groundwater region. The UBZ-2 groundwater region encompasses the flow system below the old underflow solids ponds. Because constituents in this groundwater region may migrate toward the south off-site, solute transport modeling is being used to predict the possible down-gradient concentrations that may occur.

This memorandum does not present information or technical analyses concerning fate and transport of constituents in other groundwater regions below the Monsanto plant. This information will be presented in the Phase II RI report. Numerical and analytical modeling of fate and transport is not planned for these areas.

## 2. HYDROGEOLOGIC MODELING METHODS

A modeling protocol, per EPA Region X Environmental Services Division Guidelines for Hydrogeologic Modeling (November 21, 1991), was submitted to EPA in the hydrogeological investigations memorandum (Golder, 1993b), Section 6. The modeling protocol describes the goals, methods, input data, and intended results for the modeling. This section summarizes the modeling methods. The input data and results for the modeling are presented in Sections 3 and 4.

The modeling methods were separated into two parts. Part one consists of groundwater flow modeling within the Blackfoot Lava Field. The Blackfoot Lava Field includes the entire valley in which the Monsanto plant is located, extending from the Bear River northerly to the Blackfoot Reservoir. Part two consists of solute transport modeling of constituents entering groundwater at the location of the old underflow solids ponds on the Monsanto plant. Groundwater velocity (magnitude and direction) evaluated from the groundwater flow model is used in the solute transport model. Specific details concerning these modeling methods are provided below.

### 2.1 Groundwater Flow Modeling Method

Groundwater flow modeling utilized a computer program called FLOWPATH (Franz and Guiguer, 1992). FLOWPATH models the flow of groundwater based on the physics of saturated groundwater flow in a porous medium. The FLOWPATH model has been developed with a CAD-based user interface that facilitates data input and viewing of results.

The basis for the FLOWPATH model is a mathematical balance equation (continuity equation) that is solved by a computer program. In constructing the balance equation, the rate of groundwater flow is assumed to follow Darcy's Law. The balance equation fundamental to the FLOWPATH model is given as follows:

$$T_{xx} \frac{\partial^2 h(x,y)}{\partial x^2} + T_{yy} \frac{\partial^2 h(x,y)}{\partial y^2} = q(x,y) \quad (1)$$

where

$T_{xx}$	is the transmissivity in the x-coordinate direction (ft <sup>2</sup> /d),
$T_{yy}$	is the transmissivity in the y-coordinate direction (ft <sup>2</sup> /d),
$h(x,y)$	is the hydraulic head at location x,y (ft),
$q(x,y)$	is the rate of water influx at location x,y (ft/d), and
$x,y$	are cartesian coordinates (ft).

From Equation 1, it can be observed that the FLOWPATH model uses an equation for steady-state conditions and for groundwater flow in only two dimensions,  $x$  and  $y$ . The term pertaining to the rate of water influx,  $q(x,y)$ , is used to represent features such as wells and springs ( $q(x,y) > 0$  indicates recharge to groundwater whereas  $q(x,y) < 0$  indicates withdrawal). The transmissivity parameters,  $T_{xx}$  and  $T_{yy}$ , are shown as constants in Equation 1, however, in the solution they may vary in  $x$  and  $y$  to represent heterogeneity of the aquifer materials. The boundary conditions imposed at the edges of the model domain (not shown) include constant head or constant flux types. Both types of boundary conditions were used in the FLOWPATH model, as explained in Section 3.

The solution to Equation 1 is obtained by the finite difference method, a widely used numerical analysis technique. The solution method is implicit and requires iterations to reach a final, stable solution for Equation 1. As with all numerical methods, the solution is approximate, but excellent solutions can be obtained with proper configuration and use of the model.

The results of the FLOWPATH model include several attributes of the groundwater flow system. Among these results are the groundwater elevation and groundwater velocity throughout the model area. Groundwater elevation output can be used to construct contour maps of the groundwater elevation in the Blackfoot Lava Field, which in turn may be used to make interpretations concerning groundwater flow direction. Groundwater velocity output can be used directly by the solute transport modeling, which requires the groundwater velocity to determine the advective rate of transport. The FLOWPATH model also creates output for groundwater particle pathlines. These pathlines show the path along which a discrete particle will move from the point at which it is released into the flow system to the point at which it is discharged from the flow system. By releasing particles at various locations in the groundwater flow system it is possible to determine the average transport of groundwater plumes.

## 2.2 Solute Transport Modeling Method

Solute transport modeling utilized a solution taken from the literature (Domenico, 1987) that was modified and coded into a computer program by Golder Associates Inc. A listing of the source code is provided in Appendix A and an executable version of the program is provided on diskette. The transport solution is based on a mass balance for a non-decaying dissolved solute. The dissolved solute is transported by advection, due to the bulk groundwater flow, and by hydrodynamic dispersion, due to the variations in groundwater flow velocity at the pore scale. Retardation of the solute resulting from sorption (i.e., either solute precipitation or solute adsorption to minerals) also is accounted for when appropriate.

The solution presented by Domenico (1987) is the following:

$$C(x,y,t) = \frac{C_0}{4} \operatorname{erfc}\left[\frac{(x-vt)}{2(\alpha_x vt)^{1/2}}\right] \left( \operatorname{erf}\left[\frac{(y+Y/2)}{2(\alpha_y x)^{1/2}}\right] - \operatorname{erf}\left[\frac{(y-Y/2)}{2(\alpha_y x)^{1/2}}\right] \right) \quad (2)$$

where

$C(x,y,t)$	is the solute concentration at location $x,y$ and time $t$ (mass/volume),
$C_0$	is the source concentration at $x = y = 0$ (mass/volume),
$\operatorname{erfc}(x)$	is the complementary error function of the argument $x$ ,
$\operatorname{erf}(x)$	is the error function of the argument $x$ ,
$v$	is the transport velocity (ft/d),
$\alpha_x$	is the dispersivity along $x$ (ft),
$\alpha_y$	is the dispersivity along $y$ (ft), and
$Y$	is the width of the source normal to the flow direction (ft).

Using Equation 2, the concentration of a solute can be predicted at various locations and various times. The source term represented by  $C_0$  is assumed to be continuous and constant. Equation 2 can also include retardation effects if necessary by modifying the transport velocity. Under conditions of no retardation, i.e.,  $R = 1$ , the transport velocity is equal to the seepage velocity of the groundwater. If retardation is known to influence the transport of a constituent, the seepage velocity is divided by the retardation parameter.

It should be noted that Equation 2 applies to transport in only two-dimensions, rather than three. The solution has been intentionally reduced to two-dimensions because the aquifer is thin in the vicinity of the Monsanto plant and transport in three dimensions is anticipated to be limited. Calculations of concentration by Equation 2 are made with the assumption of a constant concentration over the full thickness of the aquifer.

As shown above, Equation 2 is inadequate to assess transport from below the old underflow solid ponds because the source term does not correctly represent conditions at the Monsanto plant. Historical information indicates the source of constituents to groundwater was continuous over a finite period of time and is currently declining, thus, the solution for an indefinitely constant source is inappropriate.

Equation 2 can be modified to account for the source term behavior by a method referred to as superposition (Bear, 1979). The modified equation is the following:

$$C'(x,y,t) = C(x,y,t|C_0) + \sum_{i=1}^N C(x,y,t-t_i|C_i-C_{i-1}) \quad (3)$$

where the notation  $C(x,y,t-t_i|C_i-C_{i-1})$  is used to indicate a calculation carried out with Equation 2 substituting  $t-t_i$  for  $t$  and  $C_i-C_{i-1}$  for  $C_0$ . The term to the right of the equal sign and left of the sum is simply Equation 2. The superposition method, as indicated in Equation 3, is nothing more than a sum of solutions to Equation 2 computed for different initial times,  $t_i$ , and different source concentrations,  $C_i-C_{i-1}$ . For example, if the source began with concentration  $C_0$  at time  $t = 0$  and then stopped abruptly at time  $t = t_i$ , the sum of Equation 3 would include only one term. The source value in this term would be  $-C_0$ . Hence, the continuous source beginning at time zero is cancelled by a negative continuous source beginning at time  $t_i$ . The result is a finite constant source of concentration  $C_0$  over the time period from 0 to  $t_i$ . This logic can be applied to fit any conceivable step function representing the concentration at the source location.

The source term, representing constituents entering groundwater in the area of the old underflow solids ponds, began in about 1963 and was substantially reduced in 1983 when the ponds were taken out of use. A hypothetical function representing the actual source term is shown on Figure 2-1. As this function represents the conditions at the water table below the ponds, the active period of the ponds has been shifted by 1 year. This shift in the active period is intended to represent an estimated 1-year lag due to the transport that must occur through the vadose zone (i.e., it takes liquid about one year to reach the water table and also about one year to completely drain from the vadose zone). In Figure 2-1, the source concentration is shown to remain approximately constant when the ponds were in use and then to decline exponentially after closure of the ponds.

For the purposes of modeling solute transport from the old underflow solids ponds, the source concentration is represented by an analytical function. This function, also shown in Figure 2-1, consists of a constant segment that occurs during the period when the ponds were active followed by an exponentially declining segment. This function is defined as follows:

$$C(t) = \begin{cases} 0, & t < 1964 \\ C, & 1964 < t < 1984 \\ Ce^{-r(t-1984)}, & t > 1984 \end{cases} \quad (4)$$

where

- $C(t)$  is the source concentration at time  $t$  (mass/volume),
- $C$  is the source concentration during the active period of the ponds (mass/volume),
- $r$  is the source decay rate ( $\text{yr}^{-1}$ ), and
- $t$  is the time (yr).

As Equation 3 cannot directly implement the exponential decay function shown in Equation 4, it is necessary to approximate this function as a series of steps. To obtain the transport modeling results presented in Section 4, the exponential function was computed for 4-year intervals and  $C(t)$  was assigned the interval midpoint concentration. For example, the source concentration over the period from 1988 to 1992 was assigned a concentration value of  $C(1990)$ , as computed from Equation 4.

### 3. GROUNDWATER FLOW MODELING

The procedures followed to construct a computer model of groundwater flow include the following:

- Development of a conceptual hydrogeologic model;
- Gathering of input data;
- Model setup and calibration; and
- Presentation of results.

This section of the memorandum summarizes the conceptual model, presents input data, and presents the model results.

Earlier work concerning the hydrogeology of the Monsanto plant area and vicinity is contained in the Phase I RI report (Golder, 1992a), and a more recent Phase II RI hydrogeologic investigations memorandum (Golder, 1993b). Parts of this information are summarized here, although greater detail can be found in the earlier documents.

#### 3.1 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model identifies features of the groundwater flow system that will be represented in the computer model. As discussed above, the area considered in the conceptual model and subsequently in the computer model includes the entire Blackfoot Lava Field, as shown on Figure 3-1. There are many hydrologic features in this area including springs, creeks, and aquifers. These features are summarized below.

##### 3.1.1 Surficial Hydrologic Features

The main hydrologic features of the Blackfoot Lava Field that may be observed from ground surface are summarized below. These features will form the boundaries of the computer model, as they are either locations of recharge or locations of discharge within the groundwater flow system. More detail concerning the model boundaries is presented in Section 3.2.

**Blackfoot Reservoir** The Blackfoot Reservoir is located on the northern boundary of the Blackfoot Lava Field. Although contained within the Snake River basin, the Blackfoot Reservoir has some leakage to the south into the shallow aquifer below the Blackfoot Lava Field. Dion (1974) estimates this leakage to be about 12 cubic feet per second (cfs). This leakage from the reservoir provides the majority of groundwater that occurs in the western half of the Blackfoot Lava Field.

**Aspen Range** The Aspen Range borders the entire eastern edge of the Blackfoot Lava Field, with the exception of a short segment on the northeast edge. Shallow groundwater in the eastern half of the Blackfoot Lava Field receives recharge from the Aspen Range. This recharge originates from rainfall and snowmelt. The watershed area of the Aspen Range increases in size toward the south, thus greater recharge is anticipated to occur in this area in comparison to the northern part of the range.

**Formation Spring** Formation Spring occurs along the eastern edge of the Blackfoot Lava Field, about due east of the Monsanto plant. Formation Spring discharges approximately 20 cfs of groundwater into streams directed into the Blackfoot Lava Field (field estimate by Golder Associates Inc. staff). Formation Cave receives most of this water and provides recharge to the shallow basalt aquifer. The source water for Formation Spring is likely further to the east beyond the Aspen Range (Mayo et al., 1985). The Spring discharge is believed to rise from depth to the surface along a normal fault that borders the east edge of the Blackfoot Lava Field. Thus, Formation Spring is a recharge source to the shallow basalt aquifer, rather than a point of discharge.

**Ledger Spring** Ledger Spring and several other springs occur southeast of the Monsanto plant in the east central part of the Blackfoot Lava Field. Ledger Spring is a drinking water source for the City of Soda Springs which draws approximately 2.5 million gallons per day (MGD) from the Spring. This flow is about 1/2 to 1/3 of the total flow from the Spring. The discharge occurring at Ledger Spring enters a creek that flows southerly to the Bear River. The absence of travertine deposits and the fresh water quality of Ledger Spring indicates that discharge is from the shallow basalt aquifer. Because the discharge feeds a stream and does not percolate back into the aquifer, the Spring is anticipated to represent a point of discharge from the shallow basalt aquifer.

**Bear River** The southern edge of the Blackfoot Lava Field is bordered by the Bear River. The mean annual flow in the Bear River at a gaging station upstream from Alexander Reservoir during the period from 1954 to 1970 was 530 cfs (Dion, 1974). In this part of the Blackfoot Lava Field, groundwater discharge occurs to the Bear River, as shown by hydraulic gradients (Dion, 1974). Discharge into Bear River and Alexander Reservoir comprises the majority of the groundwater discharge from the shallow basalt aquifer.

**Big Spring Creek** Big Spring Creek discharges into the Bear River on the south side of Soda Springs. The creek is fed by Big Spring which is assumed to be a discharge point for the shallow basalt aquifer. The flows in Big Spring Creek measured at the Big Spring Creek Hatchery weir by the Hatchery personnel average 14 cfs.

**Alexander Reservoir** Alexander Reservoir occurs in the Bear River west of Soda Springs. This reservoir, along with Bear River, forms the primary discharge location for groundwater in the shallow basalt aquifer.

**Ninety Percent Range** The Ninety Percent Range lines the southwestern edge of the Blackfoot Lava Field. The range is much smaller and generally drier than the Aspen Range. A small quantity of recharge to groundwater is likely from rainfall and snowmelt in this area.

**Fivemile Meadows** Fivemile Meadows is located northwest of the Monsanto plant in the center of the Blackfoot Lava Field. The meadow is an area of groundwater discharge which forms the headwaters of Soda Creek. Seepage from Fivemile Meadows was noted to increase substantially shortly after construction of Blackfoot Reservoir around 1910 (Dion, 1974). The response of the meadows to the reservoir indicates hydraulic connection exists between the two features. Fivemile Meadows is considered to be a location of discharge from the shallow basalt aquifer in the Blackfoot Lava Field.

**Other Streams** The area southwest and south of the Monsanto plant includes several streams and irrigation ditches. Soda Creek is one of the streams in this area. Groundwater discharge from springs and precipitation provides water to these streams and they are likely in hydraulic connection with groundwater throughout their entire length. These streams ultimately discharge to either Alexander Reservoir or Bear River. With regard to the computer model, we have assumed flow between these features and the shallow aquifer is negligible away from their headwaters.

**Other Springs** Several springs exist in the area of the Monsanto plant located west and southwest of the plant boundary. These springs include Hooper, Southwest, Doc Kackley, Calf, Mormon (A, B, and C), and Homestead. These springs discharge into Soda Creek. Hooper, Southwest, and possibly Doc Kackley Springs appear to be deep conduit springs similar to Formation Spring. Mormon, Calf, and Homestead Springs appear to be discharge points from the shallow basalt aquifer in the Blackfoot Lava Field. These springs generally have small flows (less than 0.5 cfs) and were not represented in the computer model.

### 3.1.2 Aquifers

The Blackfoot Lava Field is comprised of basaltic lava flows. In general these flows consist of dense basaltic materials separated by loose, porous materials called interbeds. Horizontal groundwater flow primarily occurs in the interbed zones, which are normally +/- 10 feet in thickness. The materials in the interbed zones include sediments, such as sand and clay, and a variety of basalt textures developed along the edges of the underlying- and overlying-lava flows. These basaltic textures tend to be highly porous (e.g., scoriaceous basalt) and/or fractured (e.g., brecciated basalt). Dense, low-porosity, low-permeability basalt forms the interiors of lava flows. These dense basalt materials commonly have been fractured from columnar jointing (a phenomenon that occurs during cooling of the basalt from a molten state). These fractures are vertical and may conduct groundwater flow only in the vertical direction.

In the area of the Monsanto plant, the Blackfoot Lava Field contains two aquifers. A shallow aquifer (Upper Basalt Zone, or UBZ) occurs primarily within interbed materials and dominates the flow system. Water quality data for this aquifer indicates the presence of constituents of potential interest. Based on boreholes in the area of the Monsanto plant anywhere from one to three interbed zones, in close proximity to one another, form the shallow basalt aquifer. The total thickness of the shallow aquifer appears to average 30 feet, although individual interbed thicknesses may be on the order

of 2 to 10 feet. A deeper aquifer (Lower Basalt Zone, or LBZ) also occurs within interbed materials but is of much lower permeability, and consequently, conducts much less water through the groundwater flow system. The two aquifers are weakly connected through the intervening dense basaltic materials. In the computer model of groundwater flow only the shallow aquifer is considered. Both aquifers have been affected by high-angle, northwest trending, normal-faulting in the area of the Monsanto plant. The occurrence of faults was not represented in the computer model.

In constructing the computer model, the shallow basalt aquifer was assumed to extend throughout the Blackfoot Lava Field. The aquifer abuts sedimentary materials along the margins of the Blackfoot Lava Field and in the area of Threemile Knoll, located northeast of the Monsanto plant (Figure 3-1). These areas were also incorporated into the model by adjusting the hydraulic conductivity. The hydraulic conductivity of the sedimentary materials are observed to be much less than those of the basalt interbeds. Based on hydrogeologic investigations, the basalt interbed hydraulic conductivity averages 400 ft/d, whereas the hydraulic conductivity of the sediments is estimated to be about 40 ft/d.

### 3.2 FLOWPATH Modeling Input Data

Input data for the FLOWPATH model consist of the following:

- Aquifer type;
- Aquifer thickness;
- Aquifer hydraulic conductivity;
- Aquifer porosity;
- Boundary conditions of either constant head or constant flux;
- Discharge or recharge rates to represent springs; and
- Discharge rates for pumping wells.

Because the FLOWPATH model uses a numerical method to solve the groundwater flow equation (Section 2.1), it is necessary to locate the input data onto a grid. The grid is overlain onto the Blackfoot Lava Field and then the necessary features are located onto the grid, or to the nearest grid intersection. The grid size used in the FLOWPATH model was 2,500 feet by 2,500 feet. Detailed computer output documenting the input data is provided in Appendix B. Data input files are also contained in machine readable form on diskette.

**Aquifer Type and Thickness** As discussed above, only the shallow basalt aquifer was modeled using FLOWPATH. In constructing the model, the aquifer type was assumed to be confined as a simplifying assumption. Based on the results presented in Section 3.3, this assumption appears reasonable. By making this assumption, it was possible to specify a single aquifer thickness for the entire model area, which is an important convenience given the limited data that exist away from the Monsanto plant. This thickness was estimated to be 30 feet based on model calibration and data for the Monsanto plant area. One drawback to selecting the confined aquifer type is related to areal recharge to the aquifer. In the Blackfoot Lava Field, recharge to groundwater likely occurs through the valley interior. This recharge cannot be directly represented by the confined aquifer type and was indirectly added to the aquifer through the boundary conditions.

**Hydraulic Conductivity** The hydraulic conductivity of the shallow basalt aquifer was varied in space to represent heterogeneity of the aquifer materials. The heterogeneity occurs where the aquifer host rock changes from volcanic interbeds to sedimentary rock. The final spatial distribution of hydraulic conductivity reflects this heterogeneity and was obtained by calibration. This distribution is shown on Figure 3-3.

**Porosity** Aquifer porosity was estimated as a single value over the entire model area. This parameter was assigned a value of 0.30. The porosity is used to determine pore water velocity of the groundwater, thus, it represents an effective porosity value. The value of 0.3 was obtained partly through calibration after assuming a range of porosity from 0.15 to 0.3 for the interbed materials. The value of 0.3 was finally used due to the high pore water velocities predicted by the computer model. The value of 0.3 resulted in the smallest velocities, given the range of porosity values. The value of porosity has no effect on the solution to the groundwater flow equation (Section 2.1).

**Boundary Conditions** Boundary conditions determine the flow of groundwater across the edges of the model area. The boundary conditions, shown on Figure 3-4, include constant head boundaries at Blackfoot and Alexander Reservoirs, constant flux boundaries along the Aspen Range, Ninety Percent Range, and Bear River, and no-flow, or zero flux, boundaries along the northeast, southeast, and northwest segments. The constant head values for the reservoirs were obtained from the United States Geological Survey 1:100,000 metric topographic map for Soda Springs. Constant flux values for the Aspen Range and Ninety Percent Range were estimated based on watershed area, annual precipitation (20 inches/year), and an assumed infiltration rate (15%). These flux values were increased slightly to represent recharge occurring in the valley interior and as part of the model calibration. Constant flux values into the Bear River were developed entirely through model calibration. The gradation in the flux values from east to west along the Bear River were developed in part to represent Big Spring Creek, which was not specifically represented by the model due to its proximity to Alexander Reservoir and Bear River.

**Wells and Springs** Also shown on Figure 3-4 are the wells and springs represented in the computer model. These features are represented by one or more pumping or injection wells in the computer model. Fivemile Meadows is represented by five

pumping wells that withdraw and an estimated 15.5 cfs from the shallow basalt aquifer. This flow rate was partially established through calibrating the model. Formation Spring is represented by four injection wells that recharge 20 cfs into the aquifer. This flow rate is an estimate made in the field by Golder, as no gaging of the Spring exists, and is also partially based on model calibration. Ledger Spring was represented by a single pumping well withdrawing 5 cfs from the aquifer, a rate approximately 1.5 times greater than the City of Soda Springs demand from the Spring. The City of Soda Springs withdraws about 2 MGD from Ledger Spring. Aquifer withdrawal from pumping wells is only known to occur at the Monsanto plant (besides possibly other small domestic users to the south). The four wells at the Monsanto plant were represented by a single pumping well at the equivalent rate of 3.1 cfs.

### 3.3 FLOWPATH Modeling Results

When field data are available for the model area, the model results are obtained by calibrating the model to the data. The data for groundwater flow modeling that can be used to calibrate a model include groundwater elevation, groundwater flow direction, and groundwater flow rate. The detail of the model calibration is reflected in the scale of the model. The model presented here includes a large area, thus, the calibration cannot be based on small scale features of the flow system. For example, the model cannot be calibrated to the variation in groundwater elevation across the Monsanto plant. Rather, the calibration tries to match only the average groundwater elevation at the Monsanto plant. This type of calibration based on average conditions is also true with respect to the groundwater flow direction and groundwater flow rate.

Results from the FLOWPATH modeling are shown on Figures 3-4 through 3-6. Figure 3-4 is a groundwater elevation contour map produced by FLOWPATH. These results were obtained in part by matching the model output to a groundwater elevation map based on water levels in wells produced by Dion (1974). The main departures between the contouring shown on Figures 3-4 and 3-7 occurs along the west side of the Blackfoot Lava Field. It appears field data are limited in this area. The FLOWPATH results along the west side of the model are strongly influenced by the no-flow boundary segment in the northeast, which was added to the model based on interpretation of the watershed. The FLOWPATH results also were calibrated to the topographic elevation of Fivemile Meadows, which is about 5,950 ft amsl. This elevation is determined to coincide with the groundwater elevation based on the occurrence of discharge conditions.

The model was also calibrated to the discharge from the Blackfoot Reservoir. Dion (1974) estimated a leakage rate of about 12 cfs, and the FLOWPATH model computed a leakage rate of 14.7 cfs. While FLOWPATH overestimated the leakage rate, the values are closely comparable. Additional calibration was conducted in the southern end of the model area by adjusting the flux values along the Bear River. These values were adjusted to obtain groundwater flow directions as shown on Figures 3-4 and 3-7. The flux values are listed on Figure 3-3.

Figure 3-5 shows groundwater velocity vectors throughout the model area. The fastest flow of 26 ft/d occurs in the area of the Monsanto plant. This flow rate appears higher than actual. Based on field data from the Monsanto plant area, we estimate an average linear groundwater velocity in the UBZ-2 groundwater region of 1 to 5 ft/d (Golder, 1993b). The high flow rate may be due to an overestimation of the flow rate from Formation Spring, as this flow rate was based on visual estimation. The general increase in groundwater velocity in the area of the Monsanto plant and to the south is expected due to the reduced extent of the shallow aquifer in this area. As shown on Figure 3-2, low permeability sedimentary materials constrict the flow area in the shallow basalt aquifer at this location.

Figure 3-6 presents groundwater pathline output generated from the FLOWPATH model. This output was generated by releasing particles near to the Monsanto plant and then allowing the computer model to track their progress through the aquifer. Ultimately, the particles discharge from the aquifer into the Bear River and Alexander Reservoir. The average groundwater velocity along the pathlines was estimated as 10 ft/d. Based on this velocity, the average travel time for groundwater to reach the discharge locations from the Monsanto plant southern fence-line is about 4 years. The lower velocity for groundwater estimated from hydrogeologic field data indicates this travel time may range from 8 to 40 years.

As discussed in the earlier hydrogeologic investigations for the Monsanto plant (Golder, 1992a and Golder, 1993b), faulting influences the groundwater flow direction in the area of the Monsanto plant and likely at other locations within the Blackfoot Lava Field. This faulting was not represented in the computer model as a simplification. The absence of any faults in the computer model affects the pathline predictions, as the faulting is known to direct groundwater flow toward the southeast. Thus, pathlines shown on Figure 3-6 near to the Monsanto plant boundary are not representative of the actual groundwater flow directions. To the south, the influence of faulting on groundwater flow diminishes and the pathlines are more representative of the overall off-site flow paths and discharge locations.

#### 4. SOLUTE TRANSPORT MODELING

Solute transport modeling was performed for constituents of potential interest observed in groundwater in the UBZ-2 groundwater region (Figure 4-1). The model used to predict down-gradient concentrations for constituents of potential interest was described in Section 2.2. The results of the modeling are presented below.

##### 4.1 Source Area History

As discussed in Section 1, the modeling was conducted to evaluate groundwater concentrations of constituents of potential interest at locations down-gradient from the old underflow solids ponds (Figure 4-1). These ponds were once used to dewater solids as part of the elemental phosphorous production process. In this use, a slurry was directed to the ponds and the liquid portion was allowed to drain into the ground. The solid material remaining in the ponds was a low grade phosphorous ore that was excavated and further refined. In 1983 the ponds were closed and capped with molten slag and bentonite. At this time drainage to groundwater stopped and the slag and bentonite cap also provided a barrier to rainfall and snowmelt. Earlier work (Golder, 1993a) estimated a recharge rate to groundwater through the slag and bentonite cap of 0.2 inches per year. Although it is unknown, this recharge rate is likely of order  $10^3$  less than the recharge through the source area during the active period of the ponds.

Based on observations of declining groundwater concentrations in the source area (shown below), it appears the release of mass to groundwater has declined and is declining. The mass released to groundwater under present conditions may arise from dissolution of residual materials in the pore space of the vadose zone and aquifer and/or continued drainage of vadose zone liquids to groundwater. The former mechanism is considered more likely as almost 10 years has passed since the ponds were closed and it is likely the vadose zone moisture content has reached a steady state condition. Under this condition, little if any moisture is expected to drain from the vadose zone to the water table in the source area. The slag and bentonite cap at ground surface is a barrier to precipitation.

##### 4.2 Constituents of Potential Interest

A preliminary identification of constituents of potential interest was developed from the Phase I RI groundwater quality data (Golder, 1992a). In the Phase I RI report, Golder Associates Inc. identified constituents of potential interest based on upper tolerance limit screening (a statistical method of comparison against background water quality) and risk-based screening (a comparison against conservative human health and ecological toxicity concentrations) of the groundwater quality data. The EPA oversight consultant, SAIC, also independently identified the constituents of potential interest using similar methods (Letter from J. C. Eldridge (SAIC) to T. Brincefield (EPA) dated September 3, 1992). The SAIC analysis, however, substituted the maximum control concentration of background

data for the upper tolerance limit values used by Golder Associates Inc. This difference in the screening analyses resulted in different lists for the preliminary constituents of potential interest. The Phase II RI field investigations included the collection of additional groundwater quality data, and these data will be used in further evaluations of the constituents of potential interest.

This memorandum has been prepared based on the preliminary constituents of potential interest identified by SAIC on EPA's behalf ((Letter from J. C. Eldridge (SAIC) to T. Brincefield (EPA) dated September 3, 1992). These constituents (and there chemical symbols) for shallow fresh groundwater are listed below:

Aluminum (Al),  
Arsenic (As),  
Cadmium (Cd),  
Chloride (Cl),  
Fluoride (F),  
Manganese (Mn),  
Molybdenum (Mo),  
Nickel (Ni),  
Nitrate (NO<sub>3</sub>)  
Selenium (Se),  
Sulfate (SO<sub>4</sub>),  
Vanadium (V), and  
Zinc (Zn).

The constituents of potential interest iron and radon-222 were also identified by SAIC, but were not evaluated in the transport modeling. Using recent data for groundwater at the Monsanto plant, both constituents were found to occur at concentrations less than the maximum background concentrations. Consequently, these constituents are not constituents of potential interest based on the screening methods used by SAIC.

### 4.3 Hydraulic Transport Parameters

As discussed in Section 2.2, solute transport modeling requires input of hydraulic parameters as well as chemical parameters. Hydraulic parameters do not depend on the constituent and include the groundwater velocity and dispersivity. Values determined for these parameters are presented below.

#### 4.3.1 Groundwater Velocity

The groundwater velocity was determined to average 10 ft/d in the UBZ-2 groundwater region to the south of the Monsanto plant (Section 3.3). This value for groundwater velocity is slightly higher than the velocities obtained from Darcy Law calculations based on hydrogeologic data collected from the Monsanto plant area.

#### 4.3.2 Dispersivity

Data for longitudinal dispersivity in many different aquifer conditions was compiled by Gelhar et al. (1985). In the transport calculations presented below, longitudinal dispersivity values,  $\alpha_x$ , were obtained from the "best fit" curve drawn through the data of Gelhar et al., as shown on Figure 4-2. Dispersivity values were determined for three observation locations that were selected for output of concentration time histories from the transport model. These locations include an intermediate point in the aquifer 500 ft south of the Monsanto plant boundary (5,000 feet from the source area), a location at Soda Creek (8,500 feet from the source area), and a location at the Bear River (18,500 feet from the source area). These locations are schematically shown on Figure 4-1.

The transverse dispersivity,  $\alpha_y$ , was obtained by assuming a value for the ratio of transverse- to longitudinal-dispersivity. This ratio was assumed to be 0.01 due to the faulting in the UBZ-2 groundwater region which restricts lateral spreading of dissolved constituents.

Table 4-1 presents the dispersivity values used in the solute transport modeling. As the transverse dispersivity values were very close in value, a constant value of 3 ft was used in the model calculations as a simplification. The results of the model were found to be insensitive to the value of the transverse dispersivity within the range of the estimated values shown in Table 4-1.

#### 4.4 Chemical Transport Parameters

The source concentration and retardation parameters are referred to as chemical parameters because they depend directly on the constituent of potential interest. Data for these parameters are presented below.

##### 4.4.1 Source Concentration

As discussed in Section 2.2, the source concentration was defined as a constant segment followed by an exponentially declining segment, as shown on Figure 2-1. The constant segment of the function requires a groundwater concentration value for the active period of the old underflow solids ponds, from 1964 to 1984. The exponentially decaying segment requires a decay rate parameter. These data have not been measured directly for the constituents of potential interest and were estimated for the solute transport modeling. The first step to estimate the parameters consisted of estimating the decay rate. The decay rate was then used to estimate the concentration during the period from 1964 to 1984.

The decay rate was estimated from time history data collected at the Monsanto plant from about 1985 to present. For a declining time history of groundwater concentration in

the source area and assuming an exponential decay model, the source concentration decay rate is computed as follows:

$$r = -\frac{\ln \frac{C(t_2)}{C(t_1)}}{t_2 - t_1} \quad (5)$$

where  $C(t_i)$  is the source area groundwater concentration at time  $t_1$  or  $t_2$  (mass/volume).

For each constituent of potential interest, the source area groundwater concentration was obtained from analyses for samples collected from test well 37 (Figure 4-1). Time  $t_1$  ranged from 1985 to 1987 and time  $t_2$  ranged from 1992 to 1993. The average concentration in the neighborhood of either time  $t_1$  or time  $t_2$  was visually estimated from x-y plots of the time history data. Table 4-2 presents data and results for each constituent of potential interest. Figures 4-3 through 4-15 present the time history data for each constituent of potential interest as observed in samples from test well 37.

Given the estimated decay rate for the exponentially declining source concentration, the source area concentration for the period from 1964 to 1984 was estimated as follows:

$$C(1984) = \frac{C(t_1)}{e^{-r(t_1 - 1984)}} \quad (6)$$

As shown on Figure 2-1, the concentration during this period is constant, thus, it can be estimated by estimating the concentration occurring in 1984. Values for  $C(1984)$  are shown in Table 4-2 for each constituent of potential interest.

There were a few special cases to deal with in evaluating the parameters for the source concentration. Time history data for molybdenum and selenium concentrations were lacking for test well 37. For both constituents an average decay rate was assigned and the value of  $C(1984)$  was computed based on the currently observed groundwater concentration. The average decay rate was based on computed decay rates for aluminum, arsenic, cadmium, nickel, vanadium, and zinc.

The constituents chloride, nitrate, and sulfate also required special treatment because they occur at significant levels in background groundwater. The background concentrations were based on chemical analyses of groundwater samples collected from test well 57 in November, 1992. As shown on Figure 4-1, test well 57 is directly up-gradient from the old underflow solids ponds in the UBZ-2 groundwater region. The background concentrations were subtracted from the observed concentrations in the source area prior to computing the decay rate. The background concentration was subsequently added to

the modeling result. The background concentrations were 16 mg/L, 0.96 mg/L, and 76 mg/L for chloride, nitrate, and sulfate, respectively.

Fluoride also was a constituent that required special handling. The fluoride groundwater concentration time history in test well 37 is shown on Figure 4-7 and does not reveal that concentrations are declining. Following a sharp decline from 1985 to 1986, the fluoride concentration remains steady. To account for this pattern, a step function was used for the source term that included two constant segments. The first segment occurred from 1964 to 1984 with a concentration level of 40 mg/L and the second segment occurred afterwards with a concentration level of 17 mg/L. Although a step function is supported by the time history data, historical information on the source area indicates the source concentrations will decline. Unfortunately, data are not currently available to estimate a rate of decline.

As discussed in Section 2.2, the transport model solution is an adaptation of a constant source model, thus, it cannot handle the exponentially decaying source concentration when written as a function. Rather, the exponential function must be fit to a series of steps. For the transport modeling, a 4-year step size was used to fit the exponential decline of the source concentration. This approximation was found to provide smooth predicted concentration time histories, thus, we assume it is reasonable. Appendix C presents a table of values used to represent the source concentration in the transport modeling.

The transport model presented in Section 2.2 distributes the source over a line of length Y. The value of Y represents the width of the source normal to the direction of transport. The modeling results presented below were based on a value of Y of 600 ft, which was measured from a Monsanto site plan.

#### 4.4.2 Retardation Parameters

Chemical reactions that result in the temporary removal of a dissolved constituent from solution are represented by the retardation parameter. These reactions, referred to as sorption reactions, include both precipitation and adsorption. In both types of reactions it is assumed the dissolved and sorbed phases of the constituent are in equilibrium. The result of either reaction is a decline in the transport rate of the constituent. No mass is removed from transport by retardation processes.

Retardation is a function of the solute and the porous medium (Dragun, 1988). The retardation parameter,  $R$ , is computed as follows:

$$R = 1 + \frac{\rho_b}{n} K_d \quad (7)$$

where

$K_d$  is the distribution coefficient (ml/g),  
 $\rho_b$  is the bulk density of the porous medium (g/ml), and  
 $n$  is the porosity of the porous medium.

The distribution coefficient indicates the tendency for the solute to adhere to the solid phase of the porous medium or to precipitate from pore water. The bulk density and porosity are used for the purpose of a units conversion.

Table 4-3 presents distribution coefficients obtained from Dragun (1988) and the corresponding retardation parameters for the constituents of potential interest. In computing the retardation coefficient, the bulk density was assigned a value of 2 g/ml and the porosity a value of 0.25 ml/ml, values assumed to represent the basalt interbeds below the Monsanto plant (Freeze and Cherry, 1979). Based on these parameters the retardation parameter is equal to  $1+8K_d$ , where  $K_d$  is the distribution coefficient.

As shown in Table 4-3, distribution coefficients were available for five constituents, cadmium, manganese, molybdenum, selenium, and zinc. For these constituents, with the exception of selenium, the retardation parameter was computed from the minimum value for the distribution coefficient. As selenium in groundwater typically complexes with oxygen and forms an anion, the retardation was assigned a value of 1, i.e., no retardation occurs. Use of the minimum retardation value for the other constituents was a conservative approach with respect to the travel time of the constituents. Thus, the modeling results provide the earliest arrival times at the observation locations for the constituents of potential concern.

Where data were lacking for the distribution coefficient, the retardation parameter was determined by one of two ways. If the constituent typically occurs as an anion (a negatively charged species) in groundwater, the retardation parameter was assumed equal to 1, i.e., no retardation occurs. A retardation value of 1 was assigned to arsenic, chloride, fluoride, nitrate, selenium, and sulfate. If the constituent typically occurs as a cation (a positively charged species) in groundwater, the retardation parameter was assigned a value of 1.8. This value is based on the minimum distribution coefficient of 0.1 ml/g that was reported for zinc. A retardation parameter value of 1.8 was assigned to aluminum, nickel, and vanadium.

## 4.5 Modeling Results

The transport solution presented in Section 2.2 was used to predict concentrations at three locations in the shallow basalt aquifer based on a source located at the old underflow solids ponds and using parameter values given above. A listing of the input data files for the transport modeling is provided in Appendix D. Input data files are also provided in machine readable form on diskette.

The three observation locations were located along the plume centerline (i.e., y-coordinate = 0), which coincides with the maximum concentration in the plume at the particular x-coordinate value and are shown on Figure 4-1. The x-coordinate values for the three locations were 5,000 ft, 8,500 ft, and 18,500 ft. The first location at 5,000 ft occurs approximately 500 ft south of the Monsanto plant southern fence line near the location of TW-54 and TW-55, as shown on Figure 4-1. The second location at 8,500 ft occurs at the estimated approximate discharge point of the plume into Soda Creek, if the plume were in fact to follow a pathway to Soda Creek. The third location at 18,500 ft occurs at the estimated approximate discharge point of the plume into Bear River, if the plume were in fact to follow a pathway to Bear River.

Figures 4-16 through 4-28 present predicted time histories for the constituents at the three observation locations. The general pattern observed in the results consists of a sharp rise to a plateau representing the onset of pond usage. The plateau then continues during the active period for the ponds. Following the active period, the concentrations decline to background levels over time periods from 20 years to 100 years. The occurrence of a plateau in the predicted time histories indicates that steady-state conditions in the aquifer were predicted to occur during the active period of the ponds. In all cases except for cadmium, the predicted maximum concentration exists or has already occurred at the three observation locations. With respect to cadmium, the maximum concentration at Soda Creek is predicted to occur around the year 2000 and that at Bear River is predicted to occur around the year 2035. This delay in comparison to the other constituents is due to the high retardation parameter for cadmium.

Cadmium concentrations in groundwater are known to be controlled by the mineral otavite, a cadmium carbonate mineral. Earlier geochemical modeling of groundwater in the UBZ-2 groundwater region (Golder, 1993a) showed that otavite is likely to exist in the aquifer. In equilibrium with otavite, the dissolved cadmium concentration should remain constant at about 0.06 mg/L. Figure 29 presents predicted cadmium time histories assuming the maximum source concentration occurring during the period from 1964 to 1984 was 0.07 mg/L, a value slightly higher than the otavite equilibrium concentration. As shown by Figure 29, the position of the time history curves is unchanged, however, the maximum concentrations are lower by a factor of 2.

Fluoride also is a constituent of potential interest that commonly forms a mineral, and hence may be subject to a solubility control. Fluoride was predicted to be in equilibrium with fluorite, a calcium fluoride mineral, by the earlier geochemistry modeling (Golder, 1993a). In equilibrium with fluorite, the fluoride concentration will be limited to about 3.8

mg/L. Figure 30 presents predicted fluoride time histories assuming the present day source is constant at 4 mg/L. As shown in Figure 30, the steady-state conditions which are predicted to exist now and into the future are a factor of about 4 less than shown on Figure 4-20, which was created without consideration of solubility controls. As stated above, the steady-state conditions predicted to occur are considered incorrect, as the source is known to be finite and declining. Thus, the concentrations in groundwater should decline into the future rather than remain constant.

## 5. INTERPRETATIONS

### 5.1 Groundwater Flow Modeling

The groundwater flow model presented in Section 3 agrees moderately well with observations in the Blackfoot Lava Field. As the model was developed with a minimum of calibration, the conceptual model of the Blackfoot Lava Field groundwater flow system appears reasonable.

As pointed out, in the computer model there appears to be a problem involving the overestimation of the groundwater velocity, most notably to the east of the Monsanto plant where the velocity was predicted to be 26 ft/d. While this velocity is considered high it is not considered impossible for the materials of the Blackfoot Lava Field and the observed hydraulic gradients.

### 5.2 Solute Transport Modeling

Solute transport modeling presented in Section 4 provided reasonable predictions of groundwater concentrations for arsenic, chloride, nitrate, selenium, and sulfate. Poor predictions were obtained by the transport modeling for aluminum, cadmium, fluoride, manganese, molybdenum, vanadium, and zinc. In these cases, the model substantially overestimated the currently observed concentrations. Table 5-1 presents a comparison of predictions with observations from test wells 54 and 55. Both of these test wells are shown on Figure 4-1 and are located about 500 ft to 750 ft south of the Monsanto plant southern fence line.

In attempting to obtain a better fit of predictions to observations, the model was calibrated to down-gradient groundwater concentrations observed in 1992 and 1993. By considering model sensitivity and the input data, the retardation parameter was determined to be the only calibration parameter that could alter concentrations to the extent necessary. The source term was not a candidate for model calibration because it was developed by calibration to test well 37. Other parameters such as the source width and the dispersivities were considered to have minor effects on the model predictions.

Based on calibration to cadmium and manganese, which are two constituents with good time history data, very large retardation values ( $R = 50$  for cadmium and  $R = 45$  for manganese) were necessary to match the low observed concentrations. This same pattern was anticipated to be observed for the other constituents and the calibration was not completed. In calibrating the model to cadmium and manganese, we found a discrepancy in the predicted model trends. The predicted trends obtained using the large retardation values were increasing rather than decreasing at down-gradient locations. Based on the time history data at test wells 22 and 36 where we observe decreasing trends, the model incorrectly predicted increasing trends. Thus, it appears the calibration based on retardation was not appropriate for comparing predictions to

observations and that there are other processes occurring in the aquifer that reduce the down-gradient concentrations.

The results of the calibration indicate that certain constituents become fixed in the aquifer materials as they migrate down-gradient. The fixation of constituents within the aquifer material will lower the down-gradient concentrations below those which would be predicted by the transport model (as the transport model assumes equilibrium partitioning). This fixation process, which is primarily ion exchange, is expected for divalent and trivalent cations and is discussed by Dragun (1988). The constituents to which this transport process applies include aluminum, cadmium, manganese, molybdenum, vanadium, and zinc. For these parameters the model predictions are overestimates due to the transport processes considered by the model and the results cannot be improved by model calibration.

Although fluoride is not expected to undergo ion exchange because it is an anion, fluoride may be controlled by fluorite, as discussed above, which could lead to the poor match between observations and predictions. As shown in Table 5-1, the predicted fluoride concentration assuming solubility control by fluorite matches the observations more closely.

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## TABLES

TABLE 4-1

Dispersivity Parameter Values for Solute Transport Modeling

Dispersivity (ft)	Observation at 5,000 ft (Aquifer)	Observation at 8,500 ft (Soda Creek)	Observation at 18,500 ft (Bear River)
Longitudinal	231 ft	312 ft	460 ft
Transverse	2.3 ft	3.1 ft	4.6 ft

TABLE 4-2

Parameter Values Used to Determine Source Concentration

Constituent	$t_1$ (yr)	$C(t_1)$ (mg/L)	$t_2$ (yr)	$C(t_2)$ (mg/L)	$r$ (yr <sup>-1</sup> )	$C(1984)$ (mg/L)
Aluminum	1988	1.25	1993	0.4	0.228	3.11
Arsenic	1986.5	0.013	1992.5	0.006	0.129	0.018
Cadmium	1985	1.22	1992	0.44	0.146	1.41
Chloride <sup>a</sup>	1985.5	259	1992	59	0.228	364
Fluoride <sup>b</sup>	1988	17	1992	17	0.	40
Manganese	1987	3	1992	1.3	0.167	4.95
Molybdenum <sup>c</sup>	--	--	1993	0.76	0.125	2.07
Nickel	1988	0.245	1992.5	0.175	0.075	0.33
Nitrate <sup>d</sup>	1986	9.1	1992	4.04	0.135	11.9
Selenium <sup>c</sup>	--	--	1992.5	0.52	0.125	1.51
Sulfate <sup>e</sup>	1985	526	1992	166	0.165	620
Vanadium	1986	0.20	1992	0.15	0.048	0.22
Zinc	1986	7.2	1992	3.4	0.125	9.25

<sup>a</sup> Background concentration of 16 mg/L was subtracted from observed concentrations.

<sup>b</sup> Source function arranged as a step function with levels of 40 mg/L and 17 mg/L (see text below).

<sup>c</sup> Decay rate is average rate for aluminum, arsenic, cadmium, manganese, vanadium, and zinc.

<sup>d</sup> Background concentration of 0.96 was subtracted from observed concentrations.

<sup>e</sup> Background concentration of 74 mg/L was subtracted from observed concentrations.

**TABLE 4-3****Retardation Parameters**

Constituent	Distribution Coefficient Range <sup>a</sup> (ml/g)	Distribution Coefficient Mean (ml/g)	Retardation Parameter
Aluminum	--	--	1.8
Arsenic	--	--	1
Cadmium	1.3 - 27	1.9	11.
Chloride	--	--	1
Fluoride	--	--	1
Manganese	0.2 - 10,000	5.0	2.6
Molybdenum	0.4 - 400	3.	4.2
Nickel	--	--	1.8
Nitrate	--	--	1
Selenium	1.2 - 8.6	1.	1
Sulfate	--	--	1
Vanadium	--	--	1.8
Zinc	0.1 - 8,000	2.8	1.8

<sup>a</sup> Distribution coefficients (range and mean) were obtained from Dragun (1988).

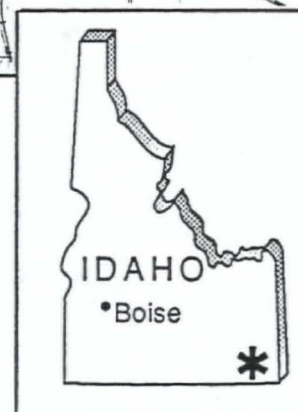
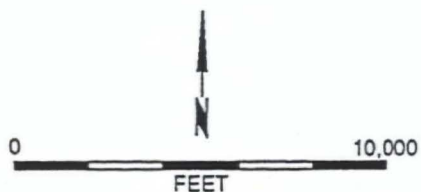
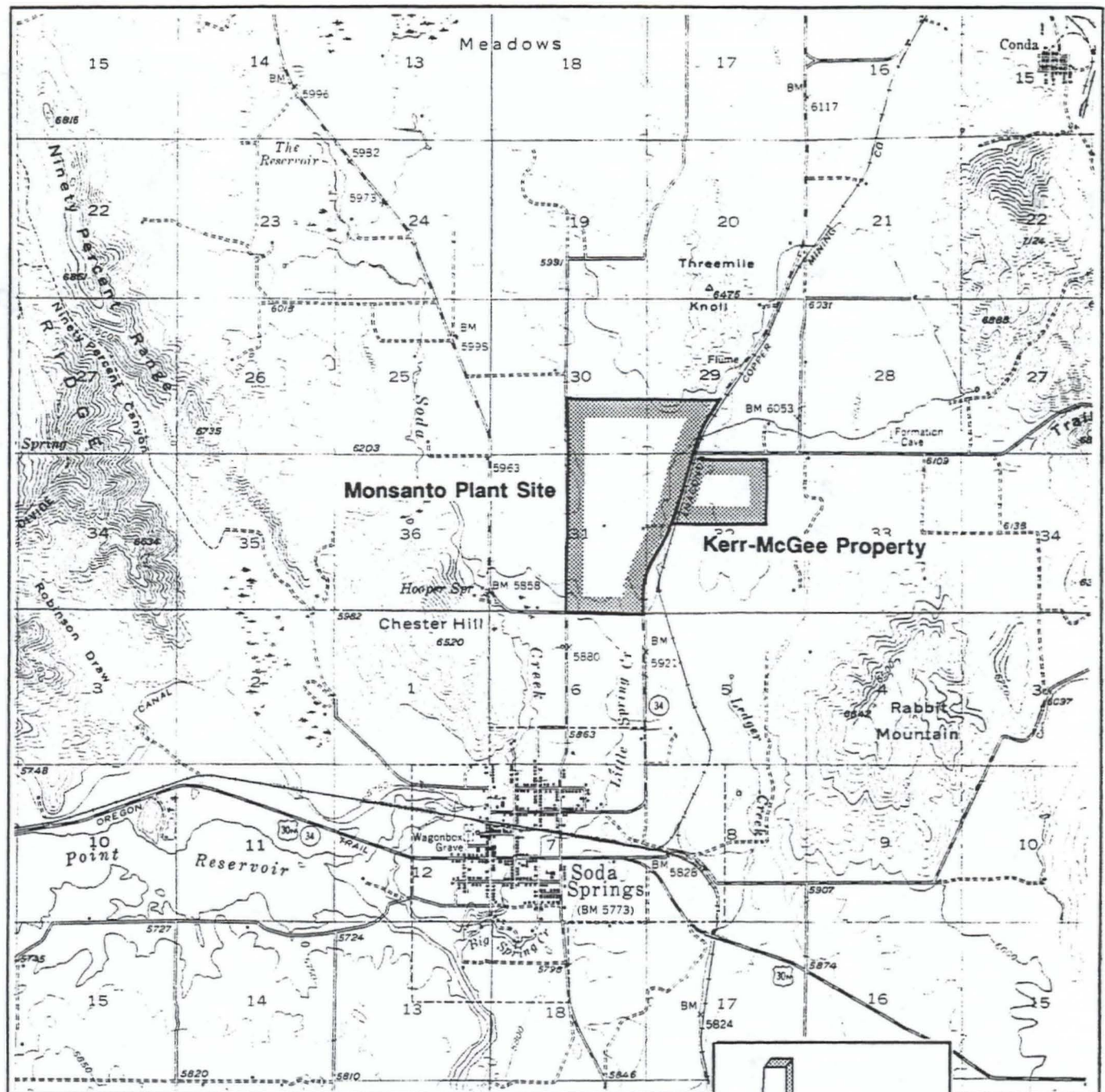
TABLE 5-1

## Comparison Between Predicted and Observed Concentrations

Constituent	Model Output @ 5,000 ft (mg/L)	Test Well 54, May, 1993 (mg/L)	Test Well 55, May, 1993 (mg/L)
Aluminum	0.702	0.108	0.026 B
Arsenic	0.006	0.001 U	0.001 U
Cadmium	1.26 (0.062) <sup>a</sup>	0.005 U	0.005 U
Chloride	78	152	64.4
Fluoride	15.5 (3.6) <sup>b</sup>	5.5	0.20
Manganese	1.96	0.028	0.02
Molybdenum	1.32	0.104	0.008 U
Nickel	0.188	0.026 U	0.026 U
Nitrate	4.9	7.38	3.08
Selenium	0.538	0.635	0.138 J
Sulfate	239	430	216
Vanadium	0.149	0.009 U	0.009 U
Zinc	3.88	0.05	0.041 U

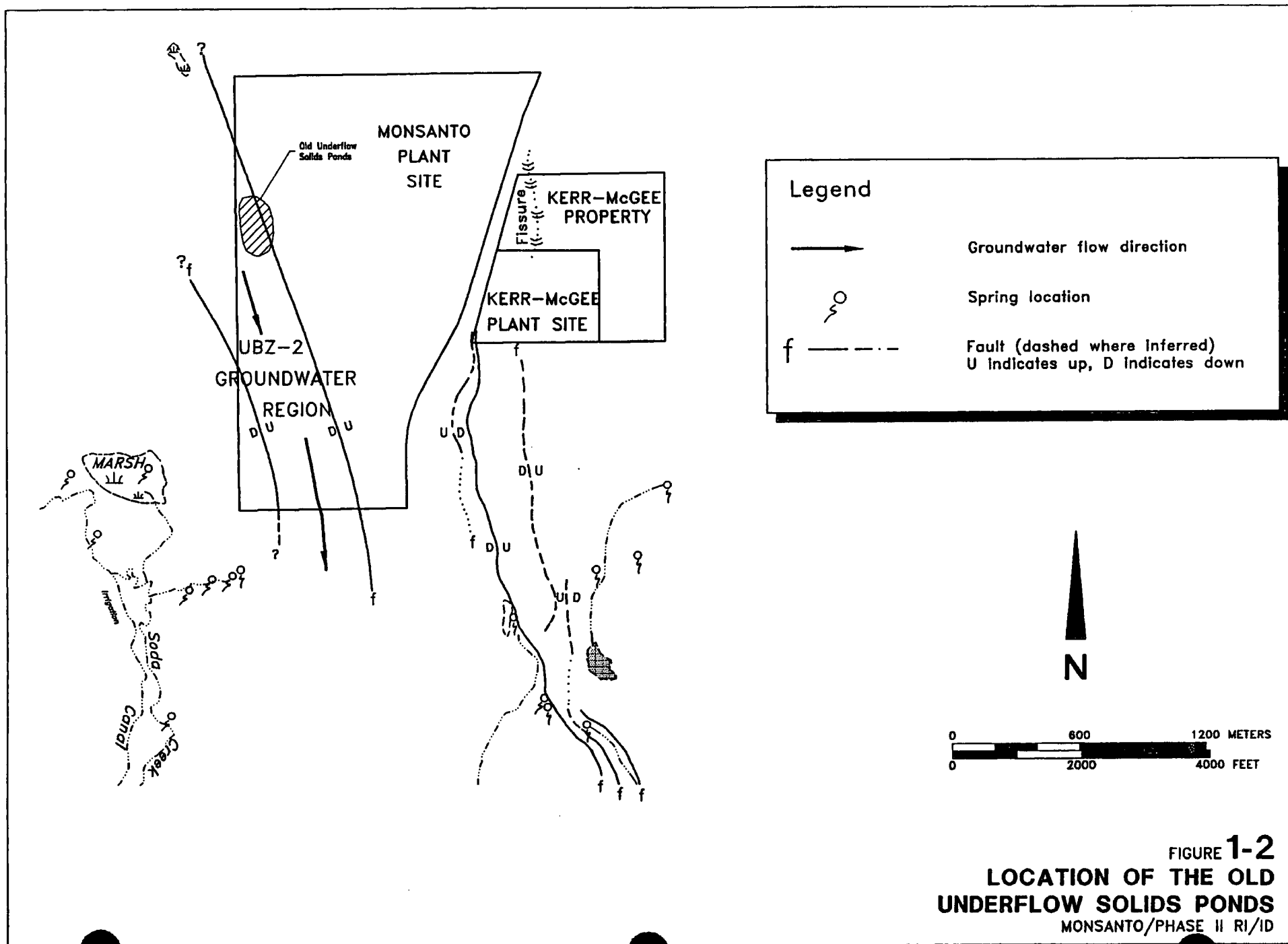
<sup>a</sup> Value in parentheses is prediction with otavite solubility control. <sup>b</sup> Value in parentheses is prediction with fluorite solubility control. U undetected, B questionable, J estimated value.

FIGURES



SOURCE: Topographic map of the USGS  
Soda Springs Quadrangle (1:62,500) 1948.

FIGURE 1-1  
LOCATION MAP  
MONSANTO/PHASE II R/ID



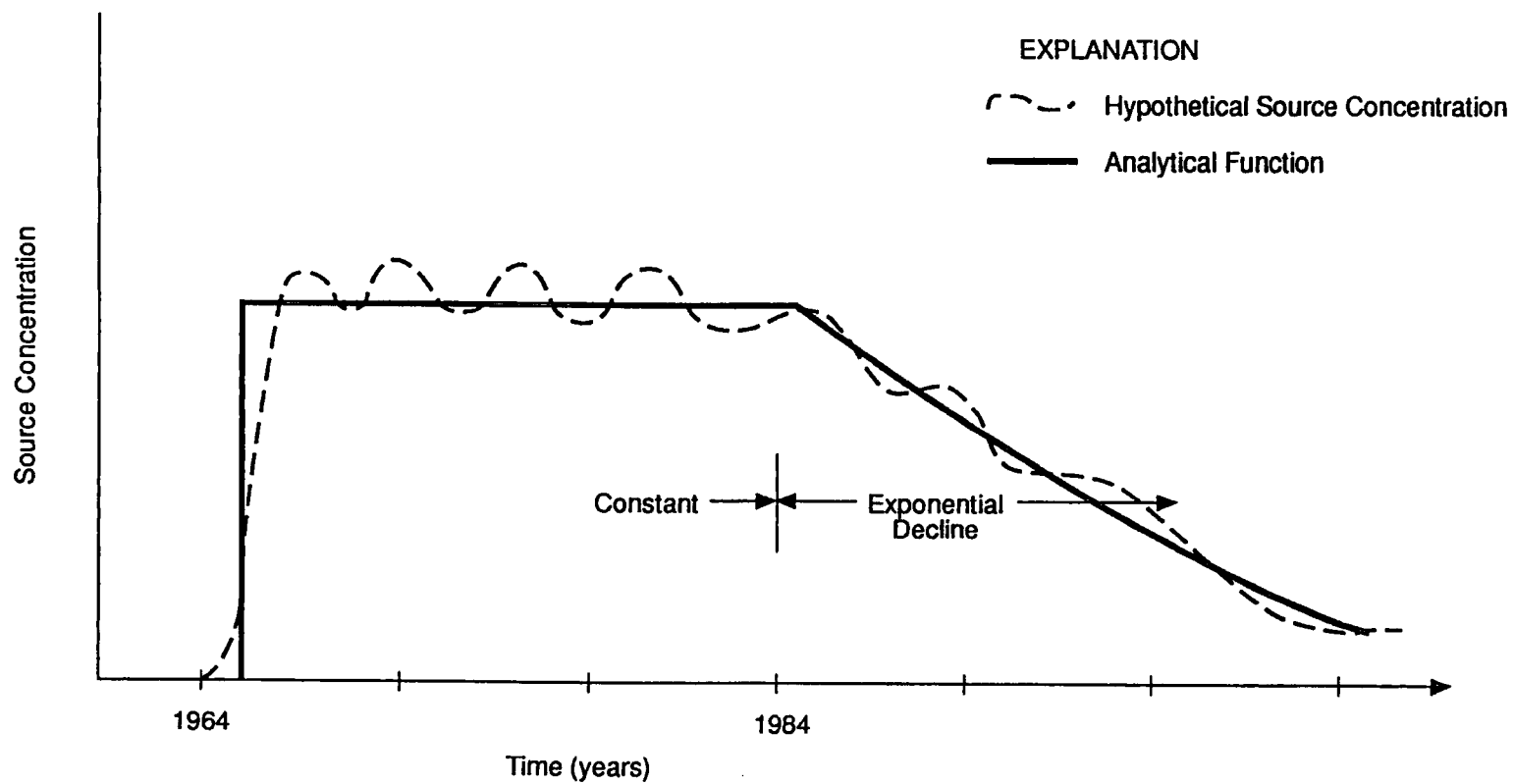
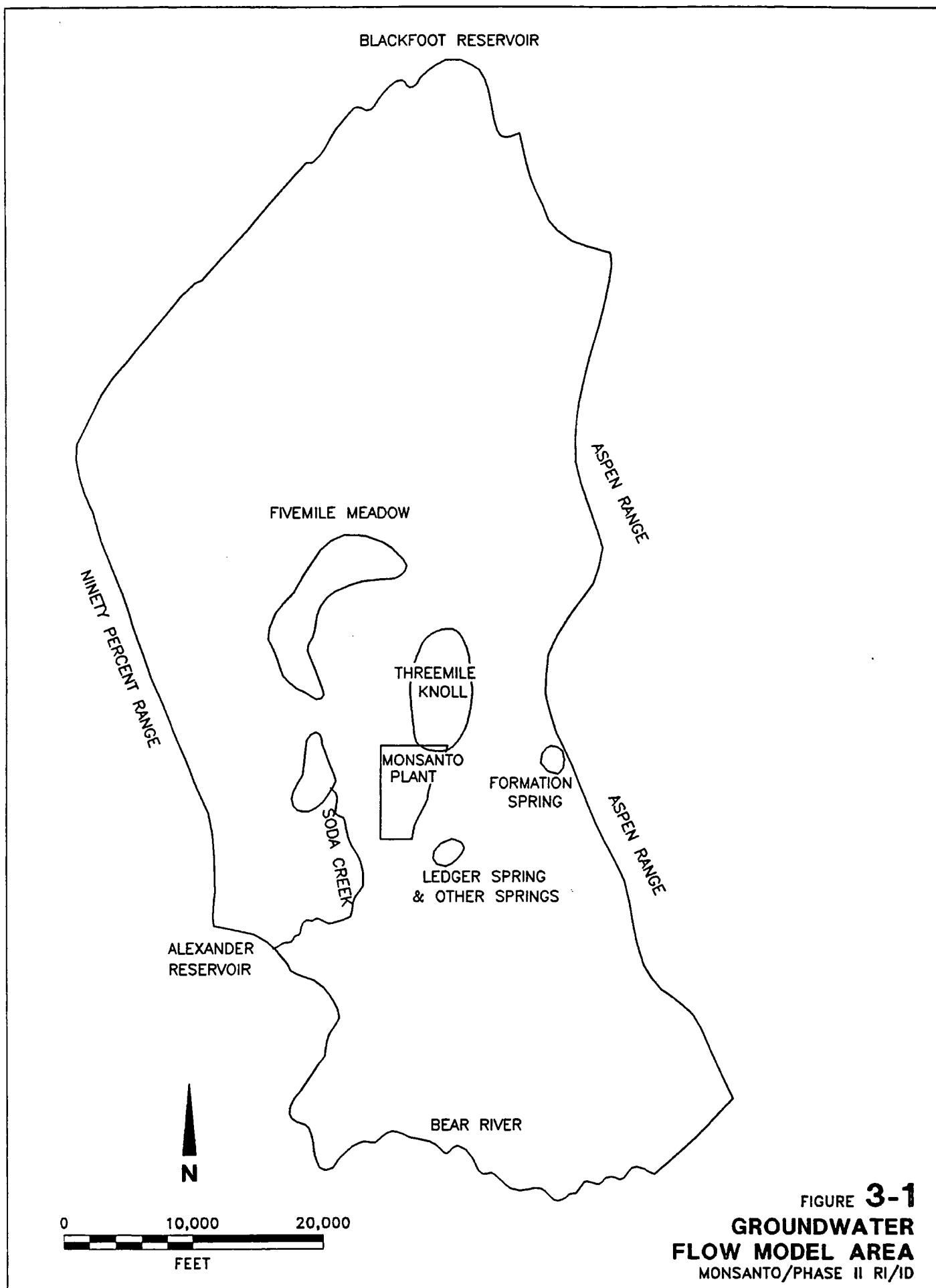
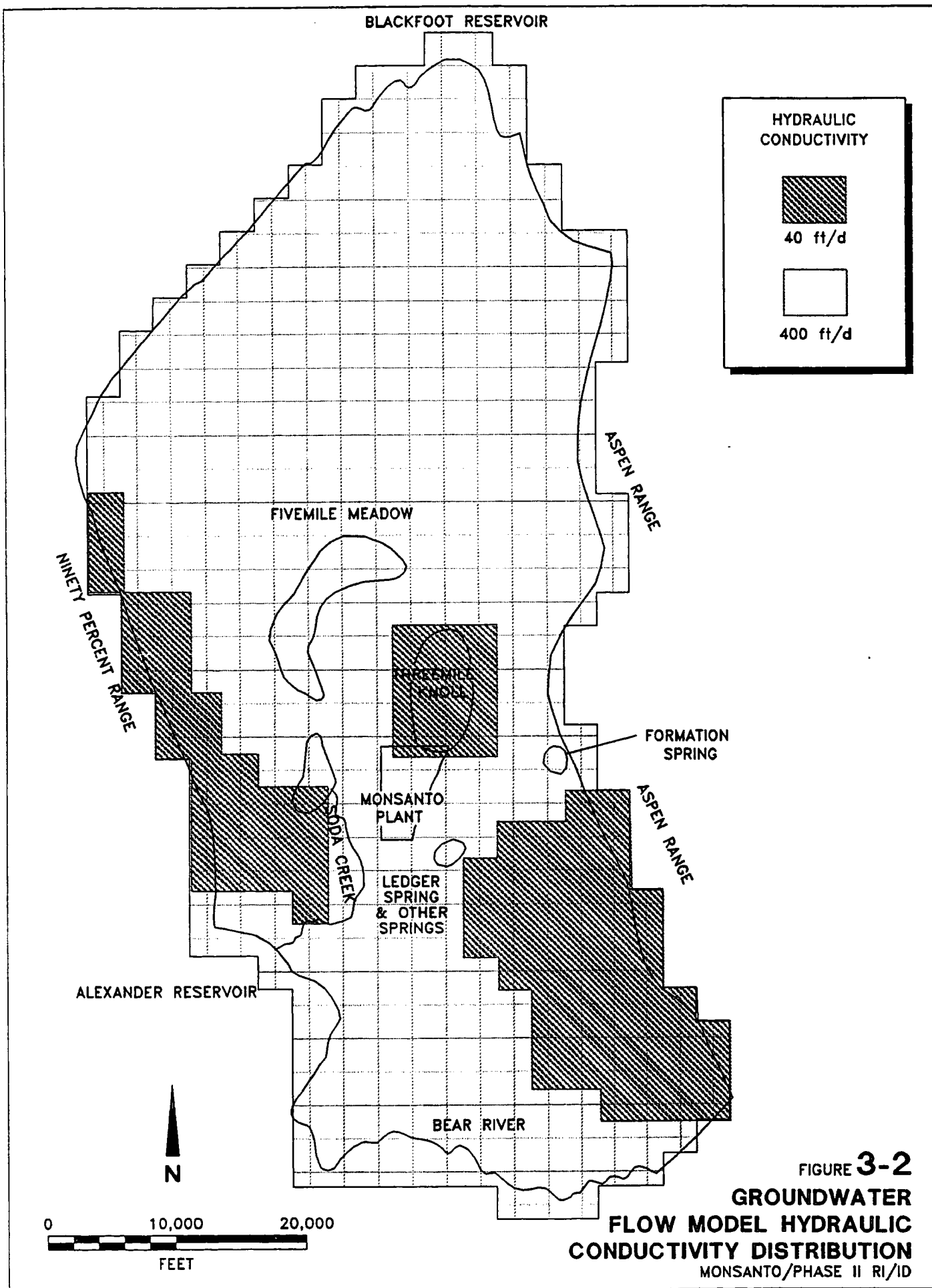
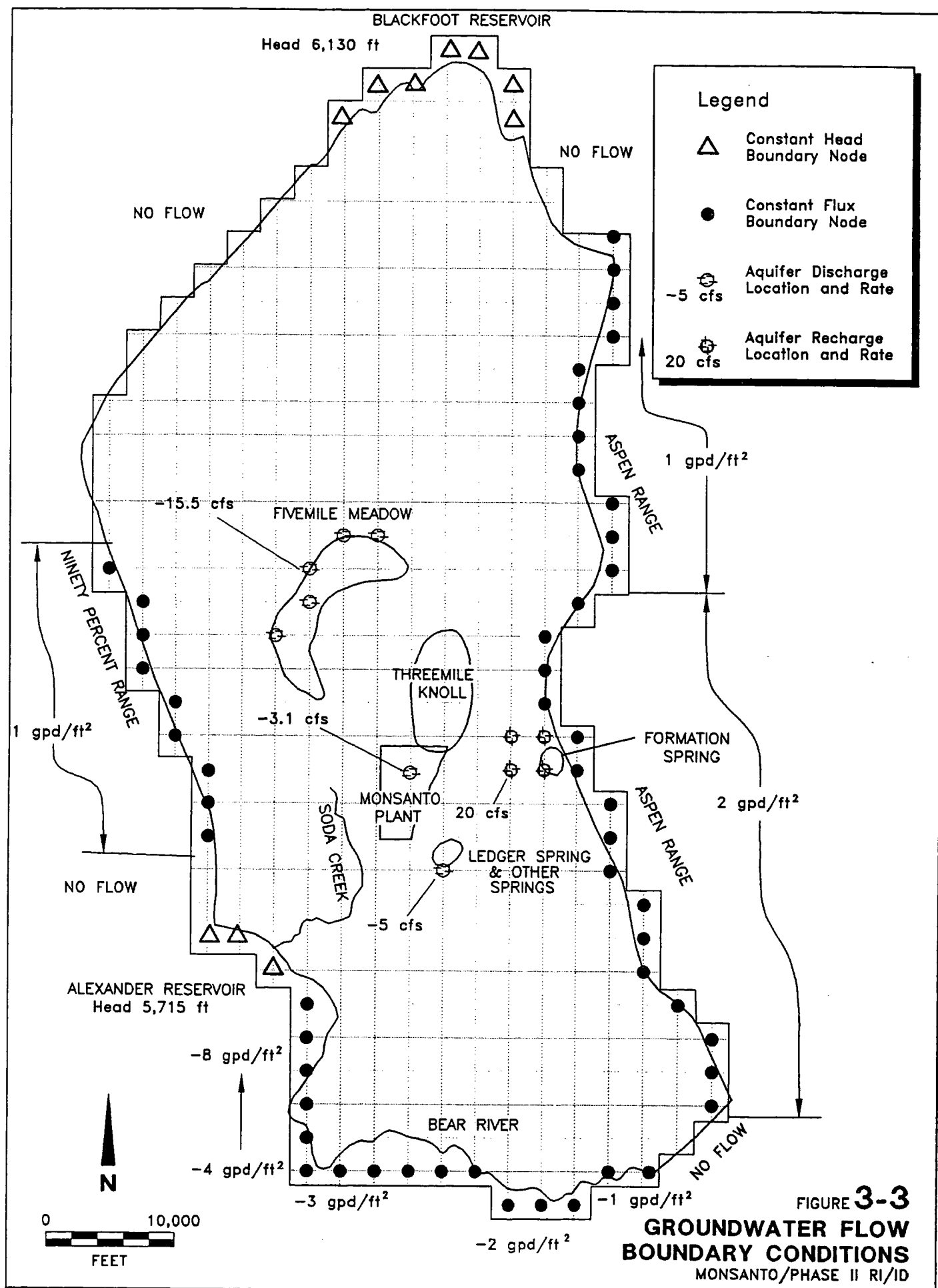
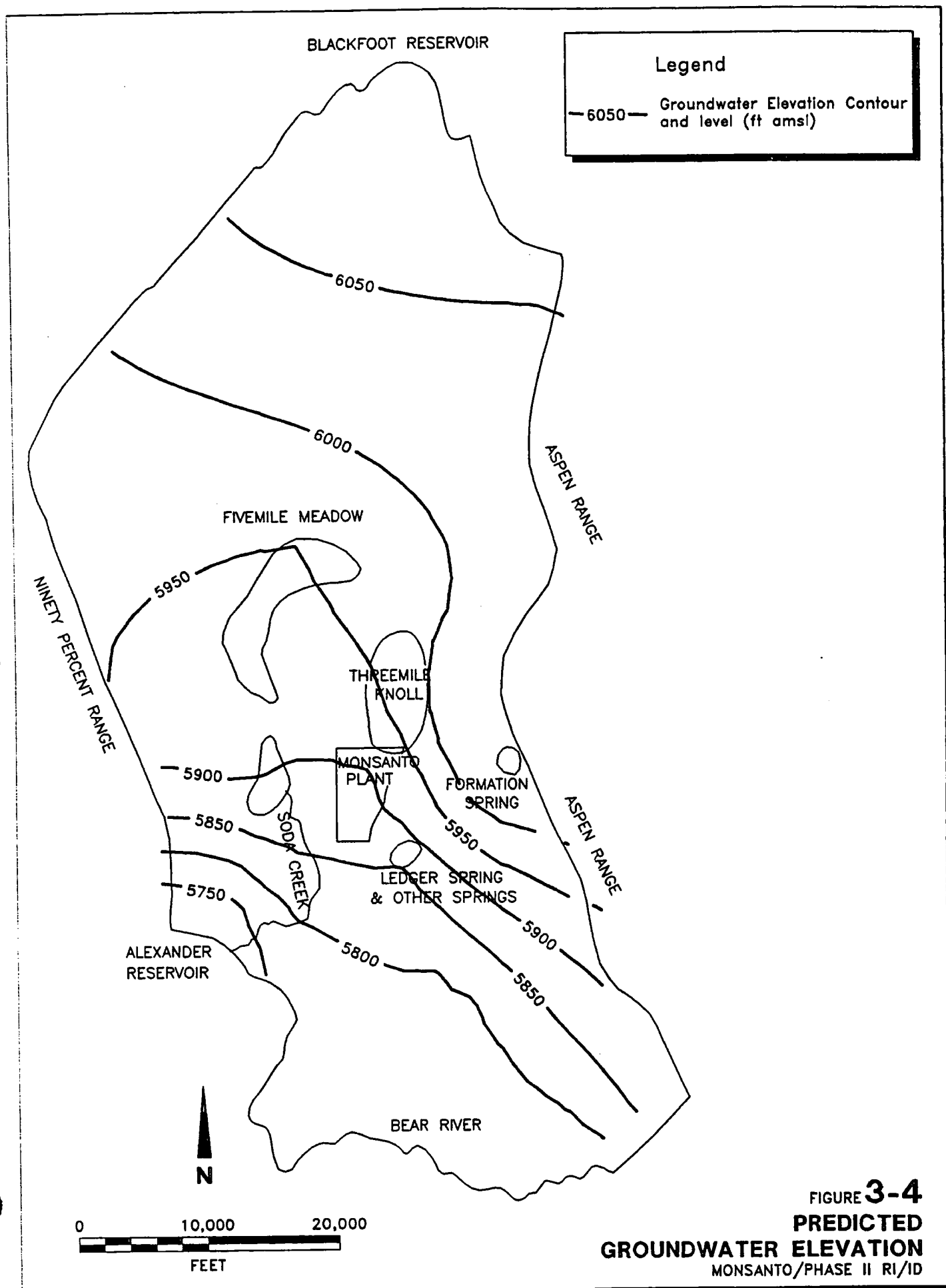


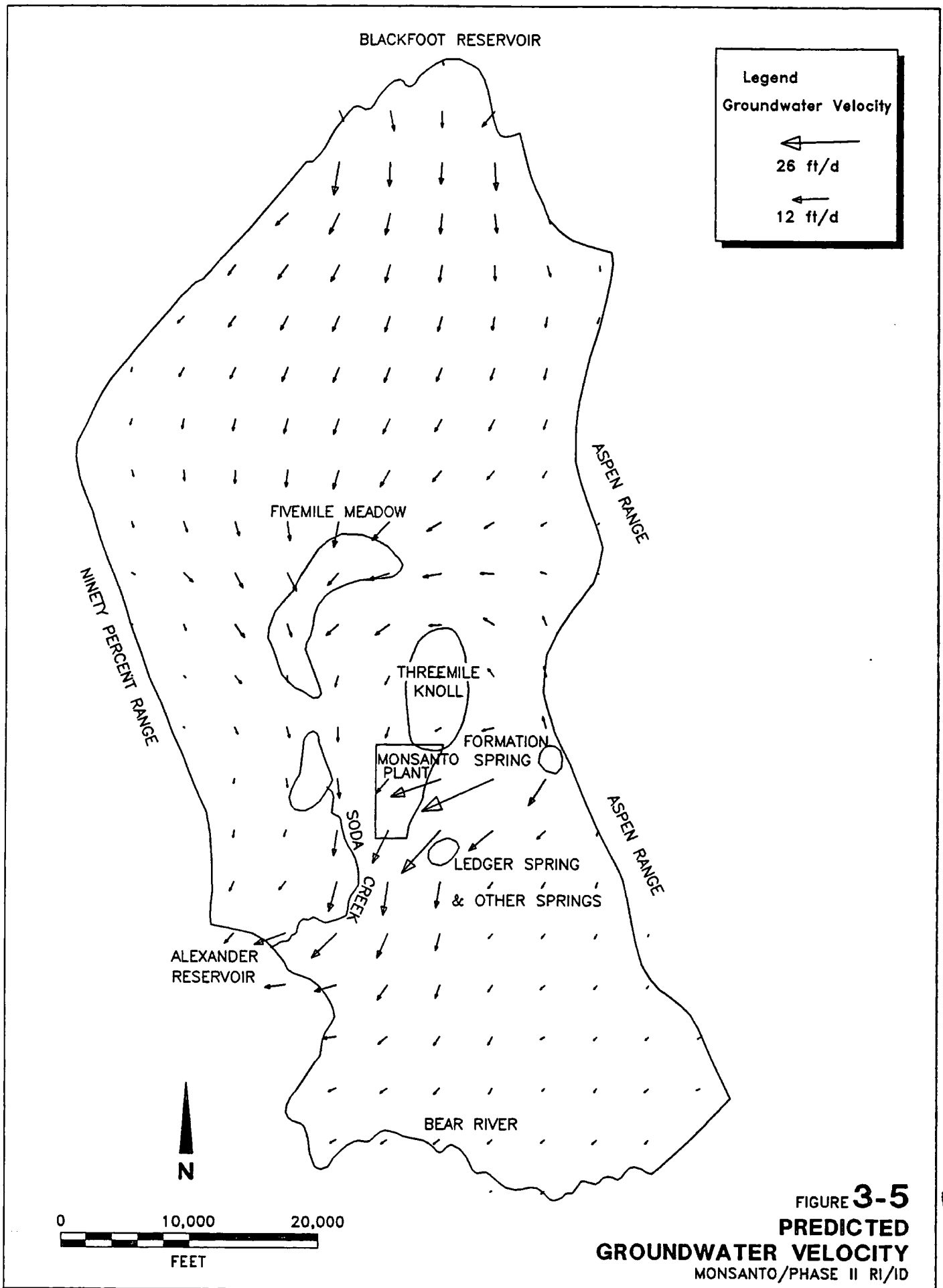
FIGURE 2-1  
**HYPOTHETICAL SOURCE  
 CONCENTRATION TIME HISTORY**  
 MONSANTO/PHASE II R/ID











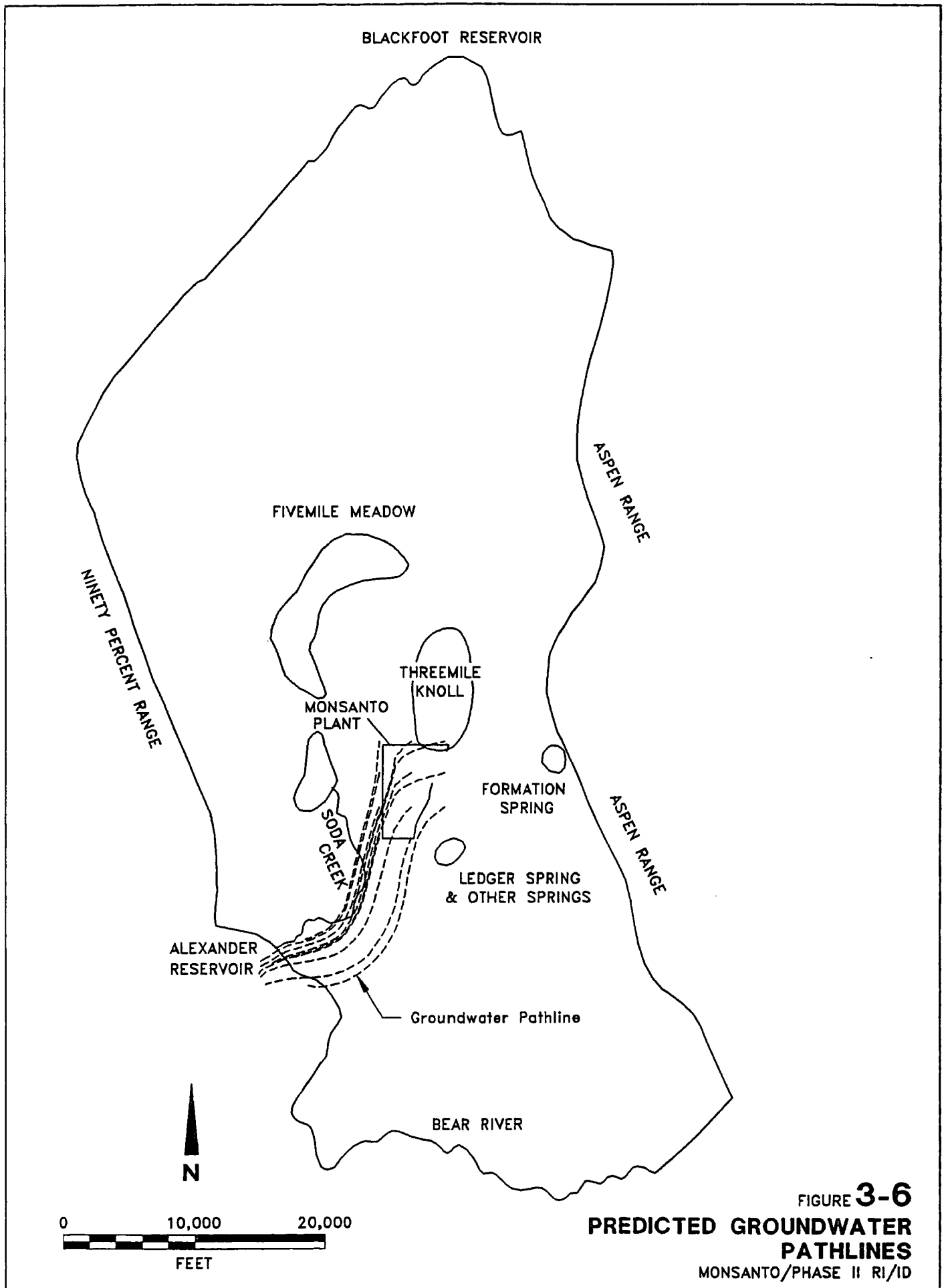
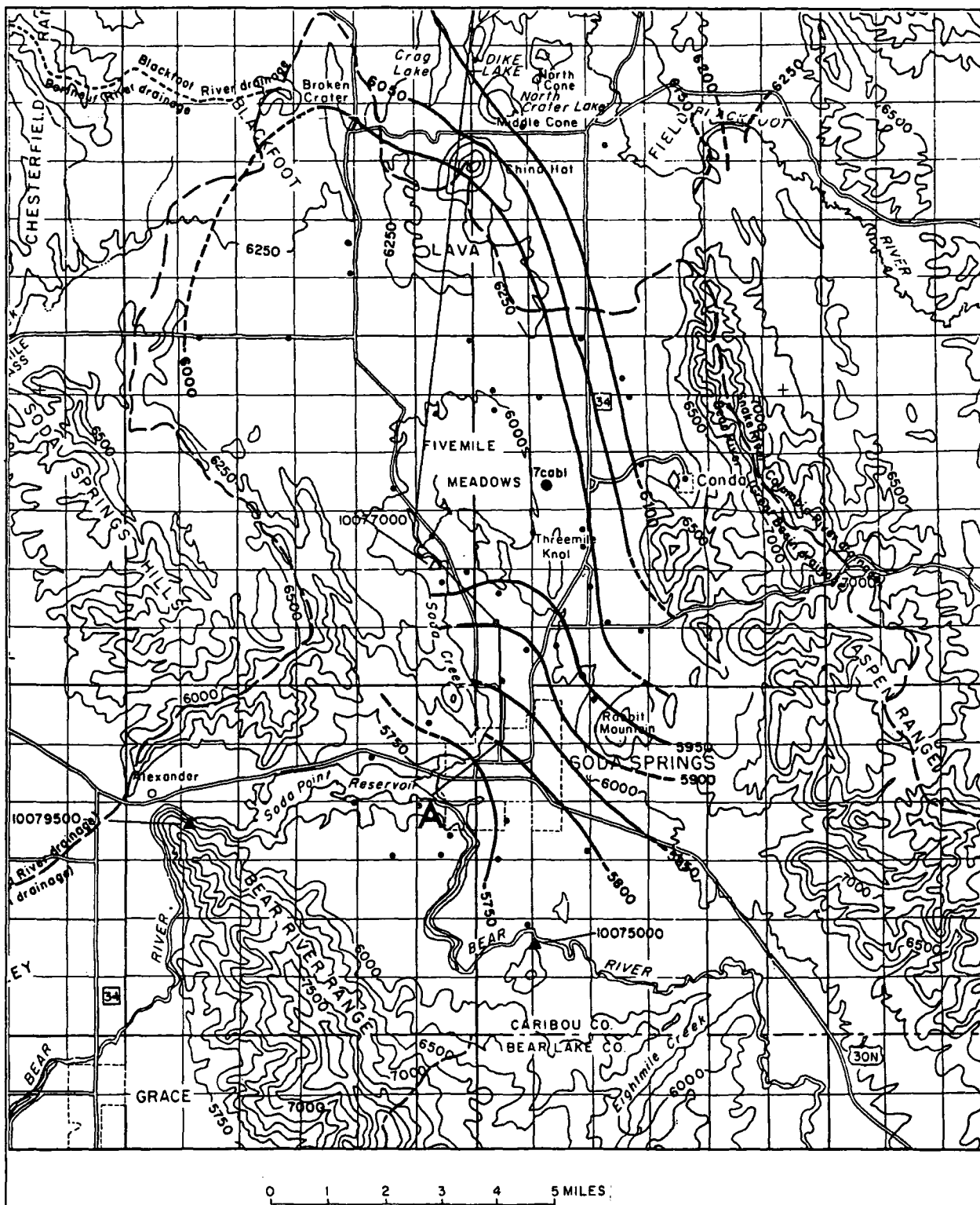


FIGURE 3-6  
**PREDICTED GROUNDWATER  
PATHLINES**  
MONSANTO/PHASE II RI/ID



(Adapted from Dion, 1974)

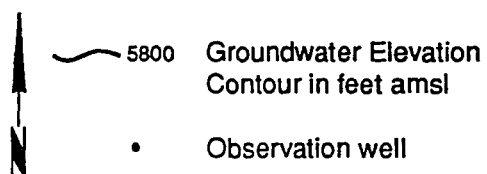


FIGURE 3-7  
 BLACKFOOT LAVA FIELD SHALLOW  
 BASALT AQUIFER GROUNDWATER ELEVATION  
 MONSANTO/PHASE II RMD

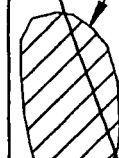


?

TW-57



Old Underflow  
Solids Ponds  
(Approx. Location)



MONSANTO  
PLANT  
SITE



KERR-McGEE  
PROPERTY

Fissure



### LEGEND

⊕ TW-35

Monitoring well location and name



Spring location



Fault (dashed where inferred)

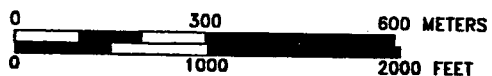
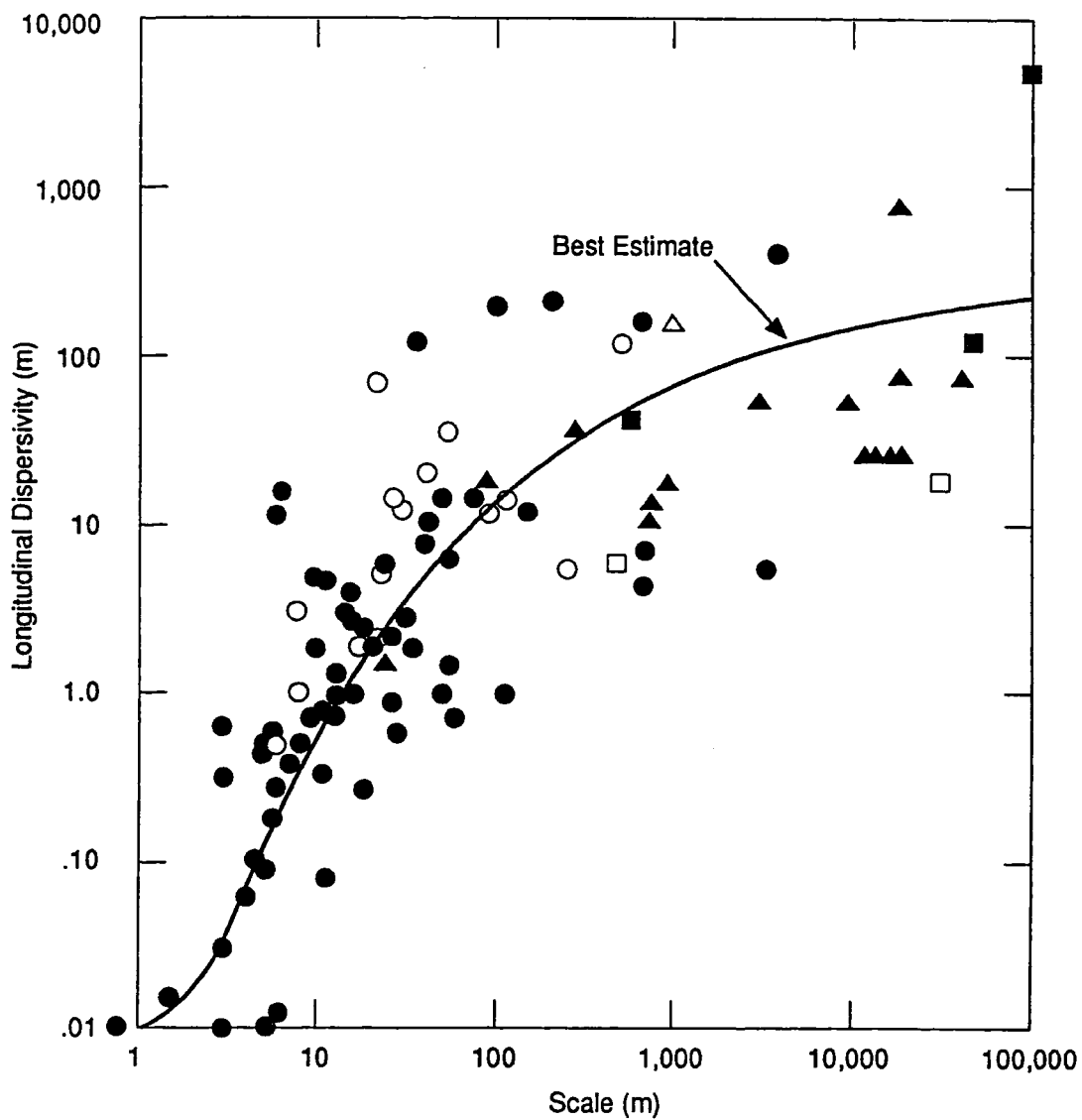


FIGURE 4-1  
LOCATION MAP FOR  
TRANSPORT MODELING  
MONSANTO/PHASE II RI REPORT/ID



- Based on Field Tracer Tests
- ▲ Based on Contamination Sites
- Based on Environmental Tracers

Open symbol indicates fractured media  
 Solid symbol indicates porous media

FIGURE 4-2  
 SCALE DEPENDENCY OF DISPERSIVITY  
 MONSANTO/PHASE II RI/ID

Adapted from Gelhar et al., 1985

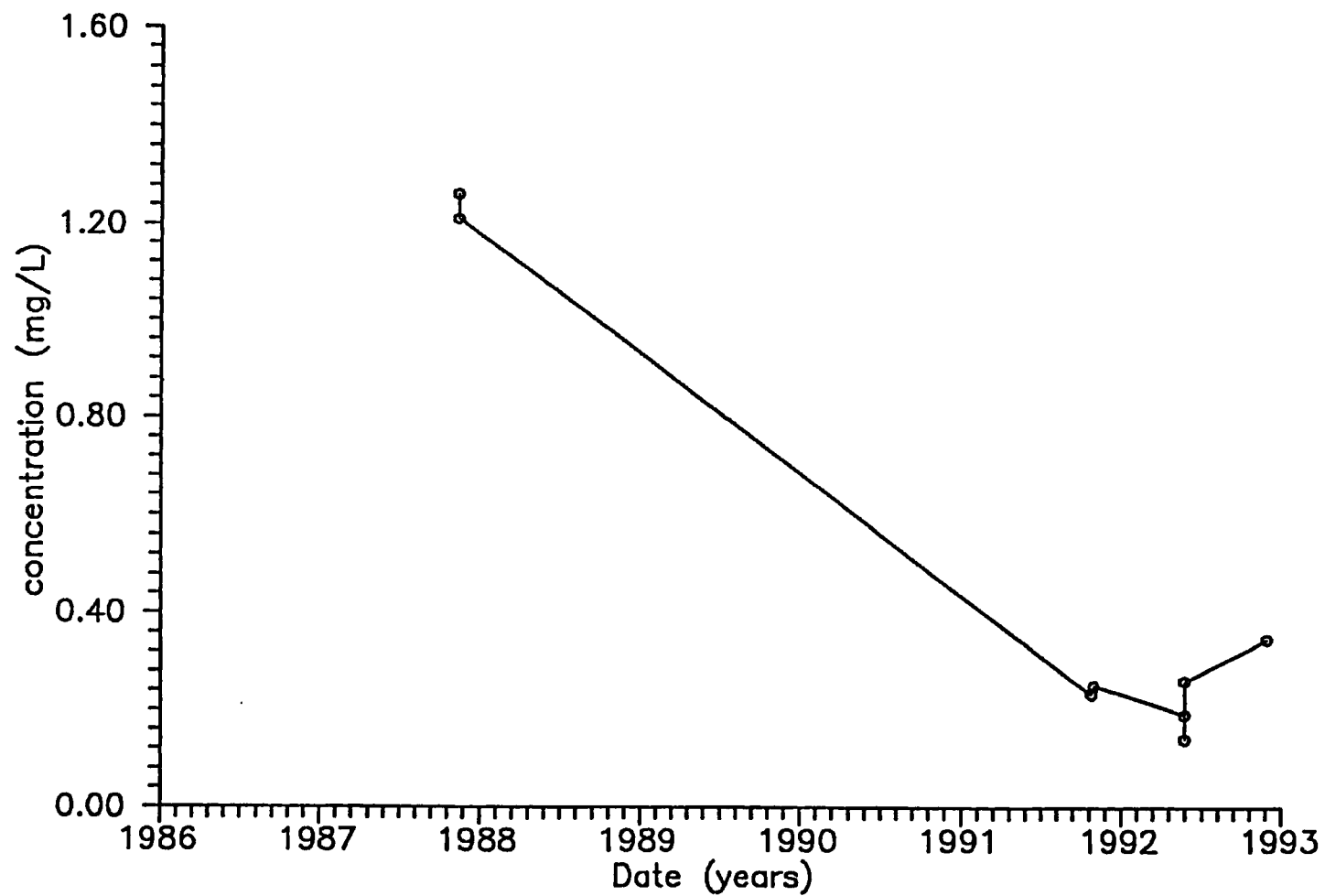


FIGURE 4-3  
ALUMINUM TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/I/D

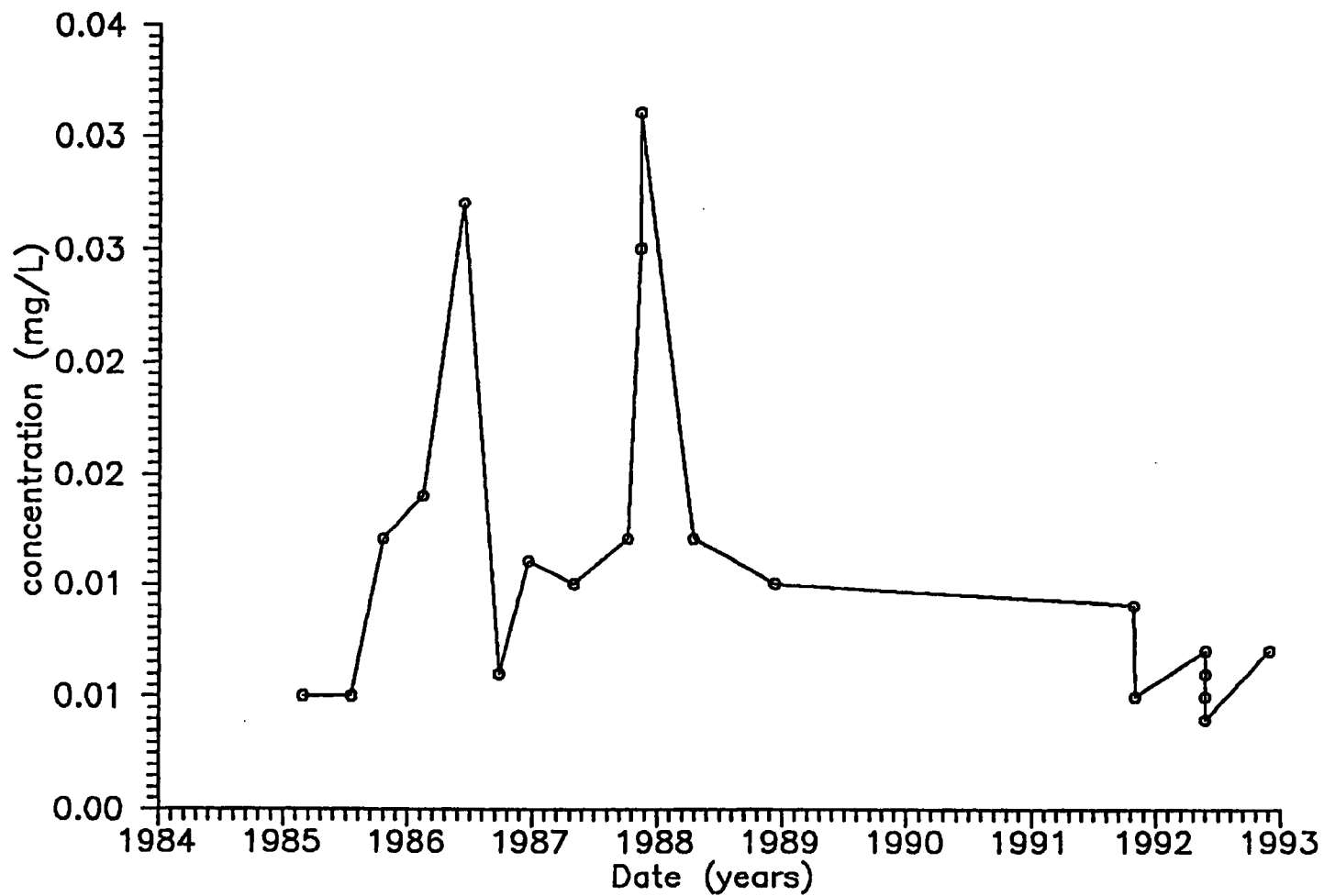


FIGURE 4-4  
ARSENIC TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

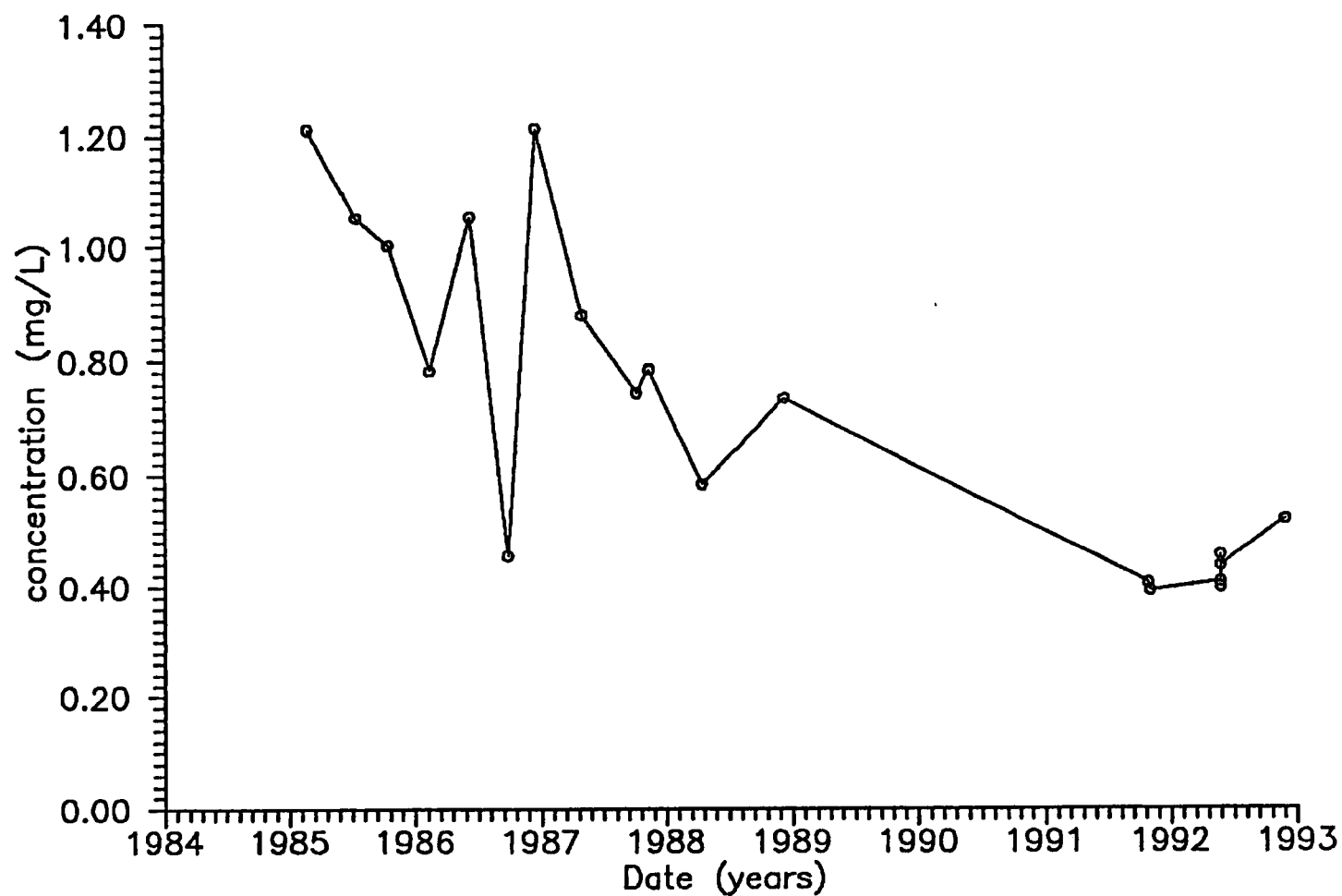


FIGURE 4-5  
CADMIUM TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

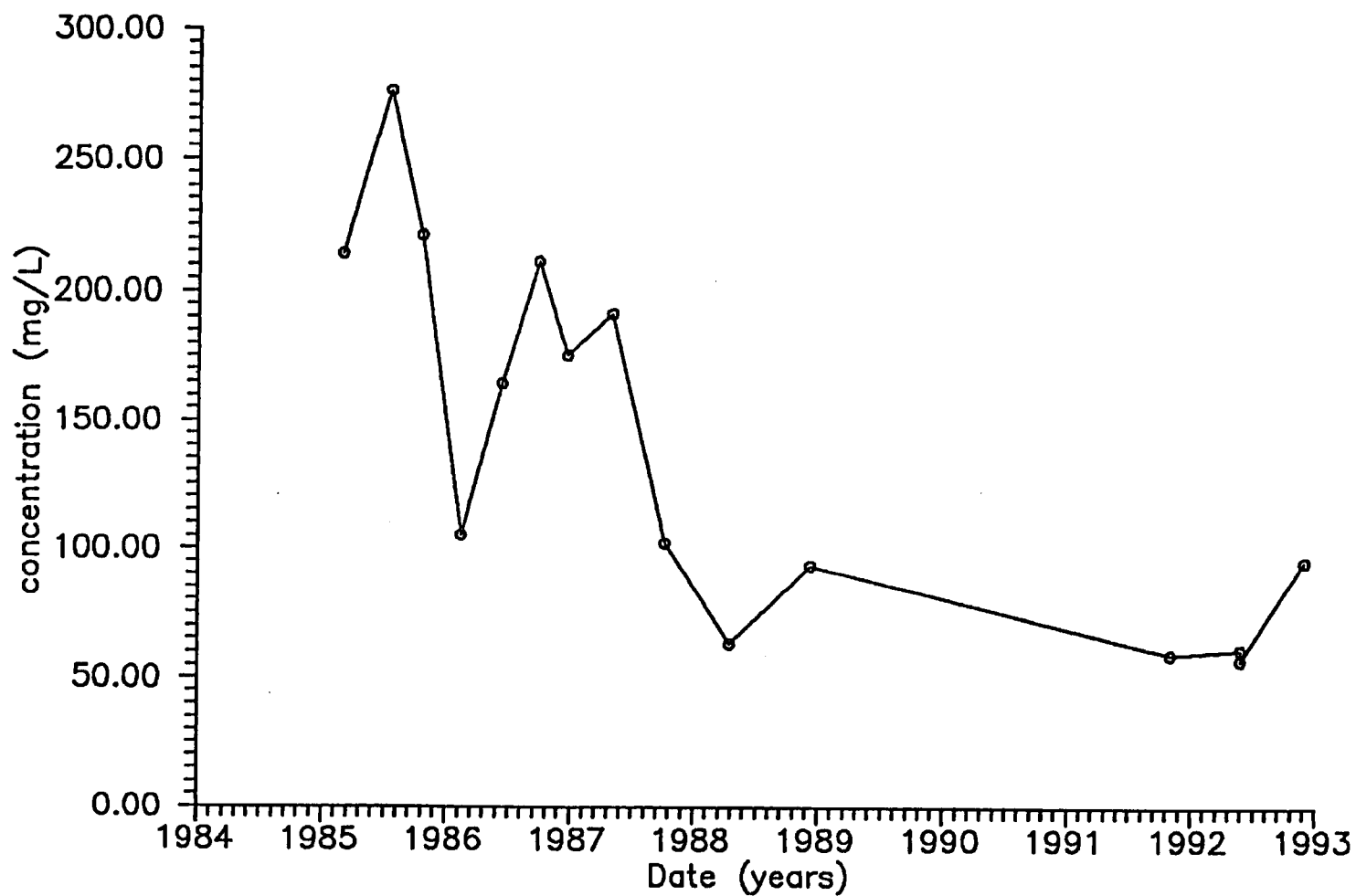


FIGURE 4-6  
CHLORIDE TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II RI/ID

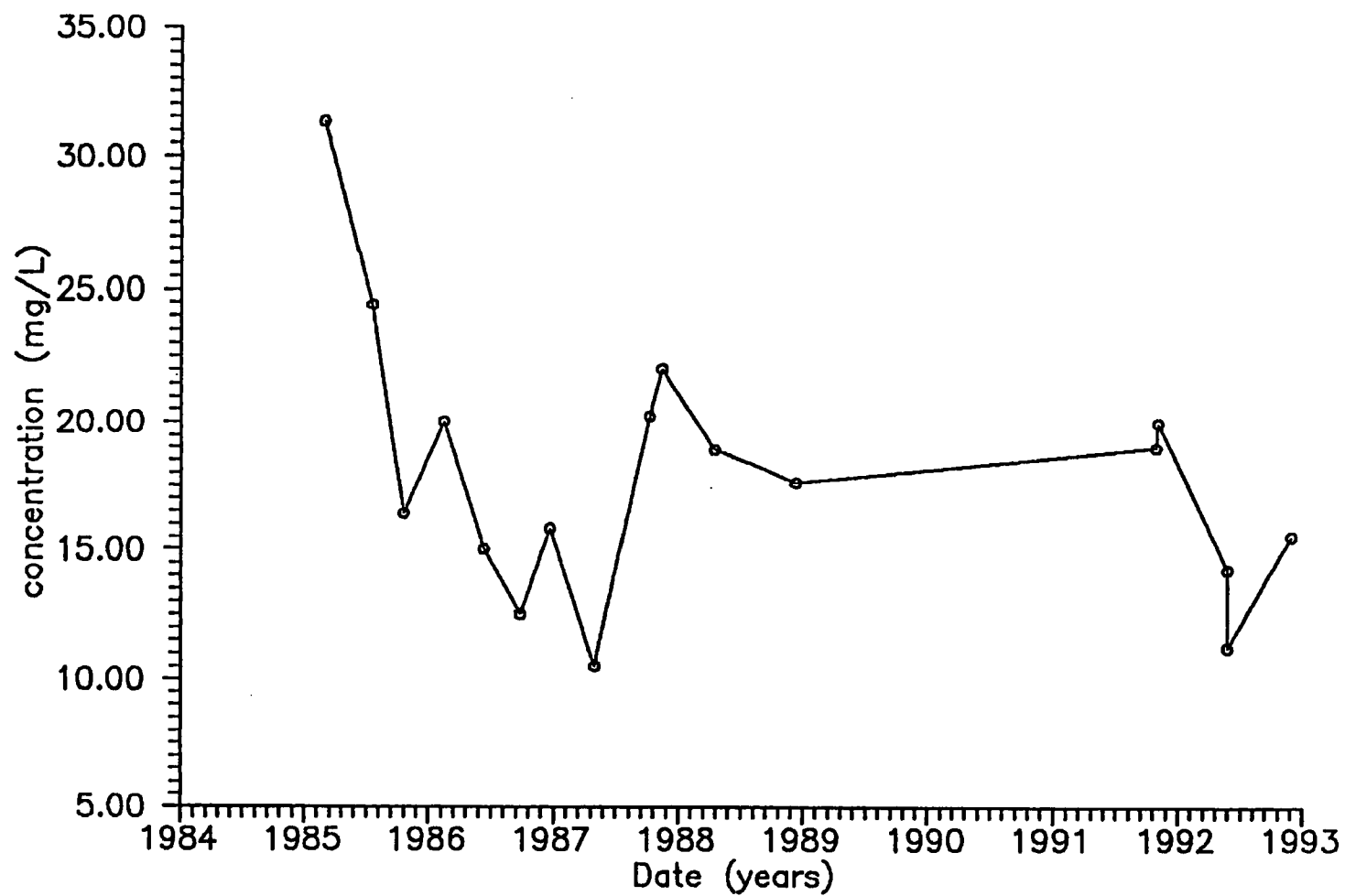


FIGURE 4-7  
FLUORIDE TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

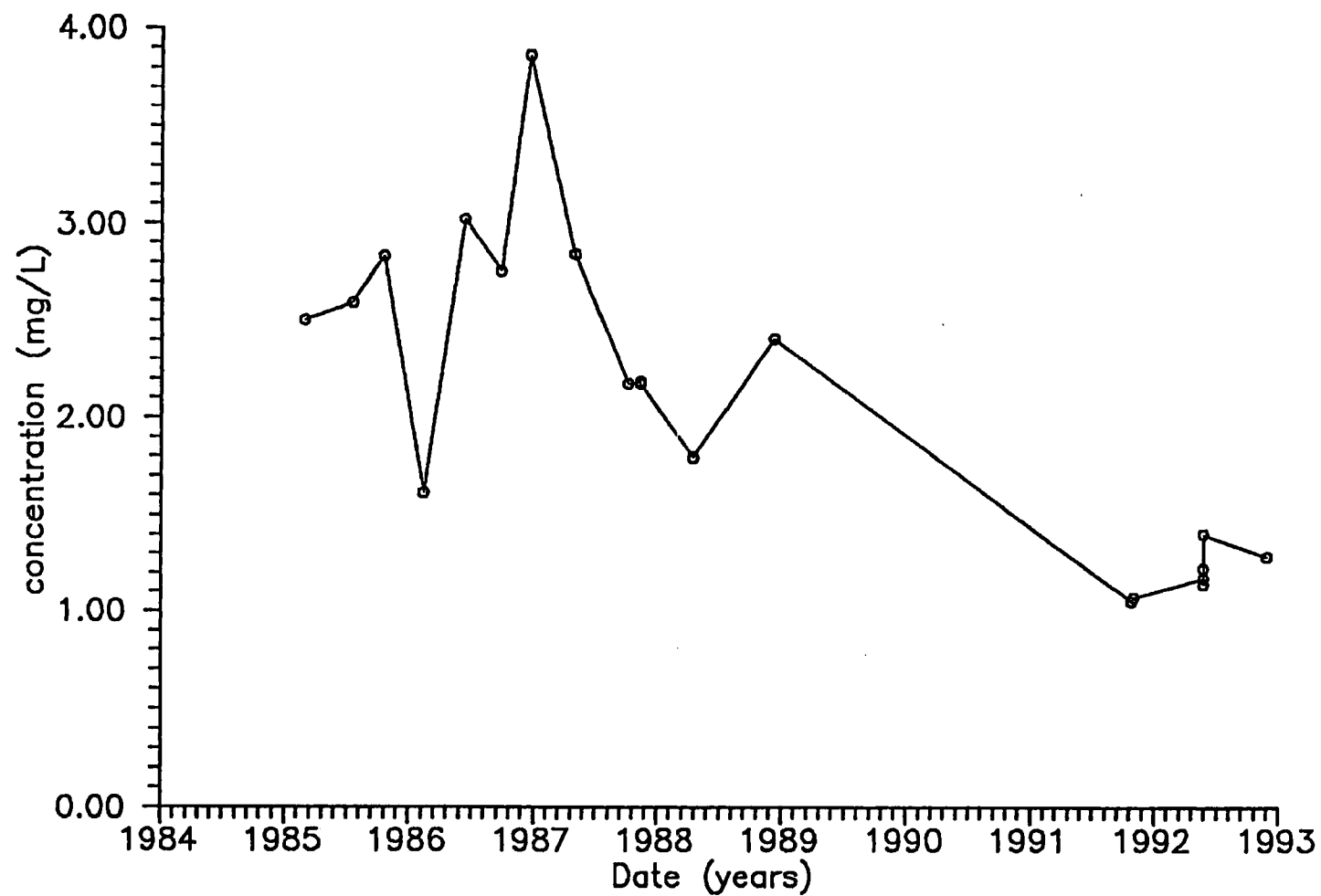


FIGURE 4-8  
MANGANESE TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

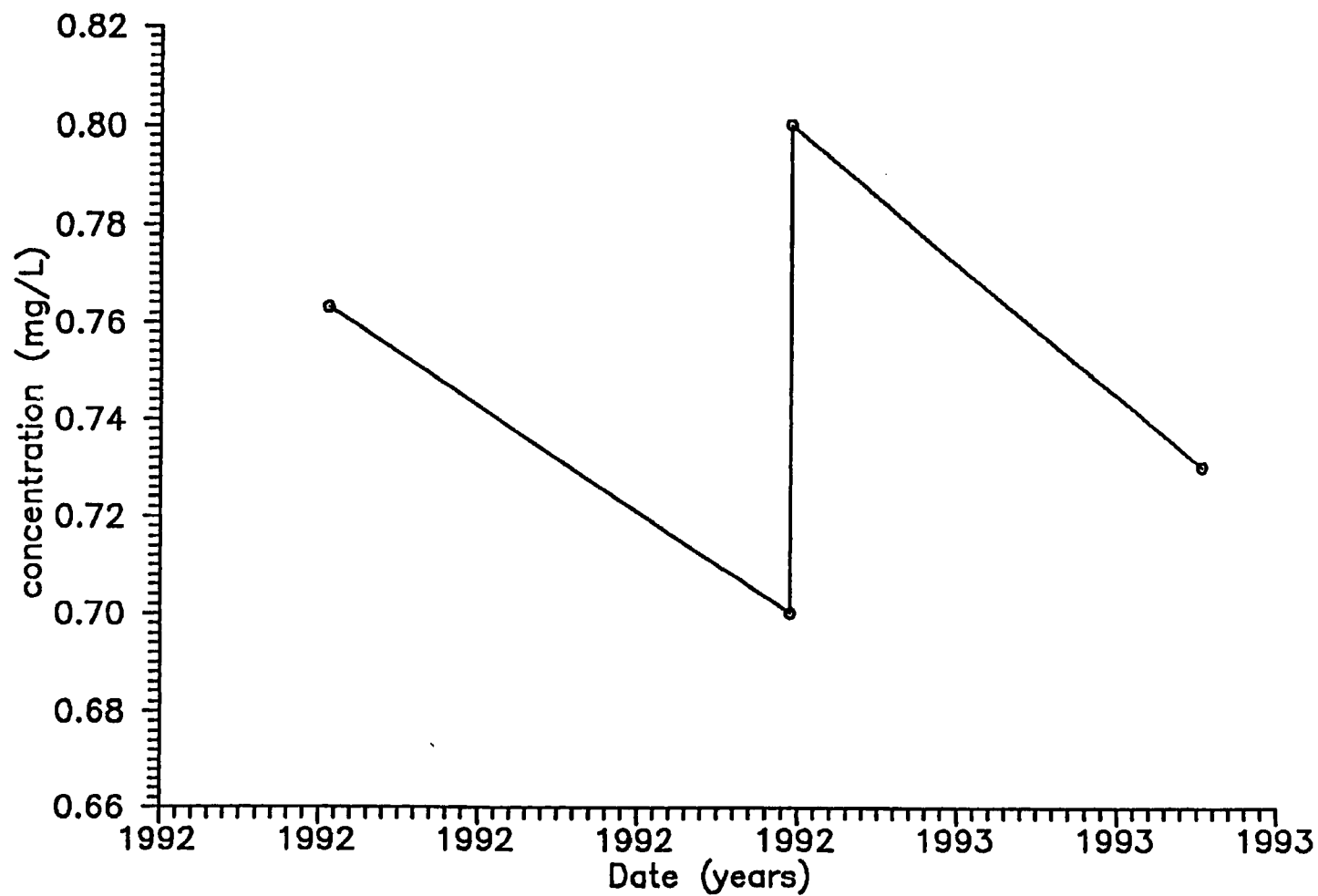


FIGURE **4-9**  
**MOLYBDENUM TIME HISTORY**  
**TEST WELL 37**  
MONSANTO/PHASE II R/ID

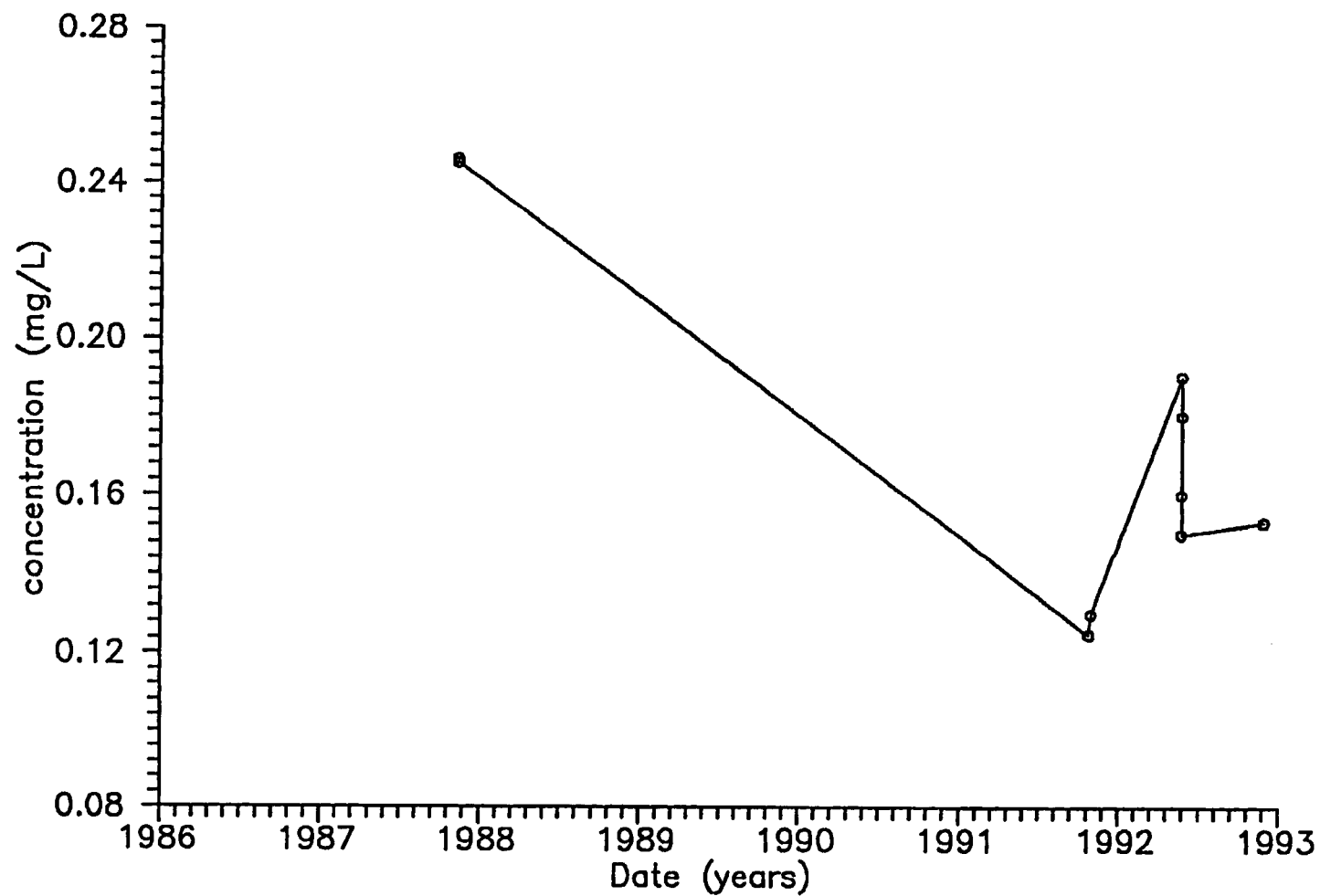


FIGURE 4-10  
NICKEL TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II RI/ID

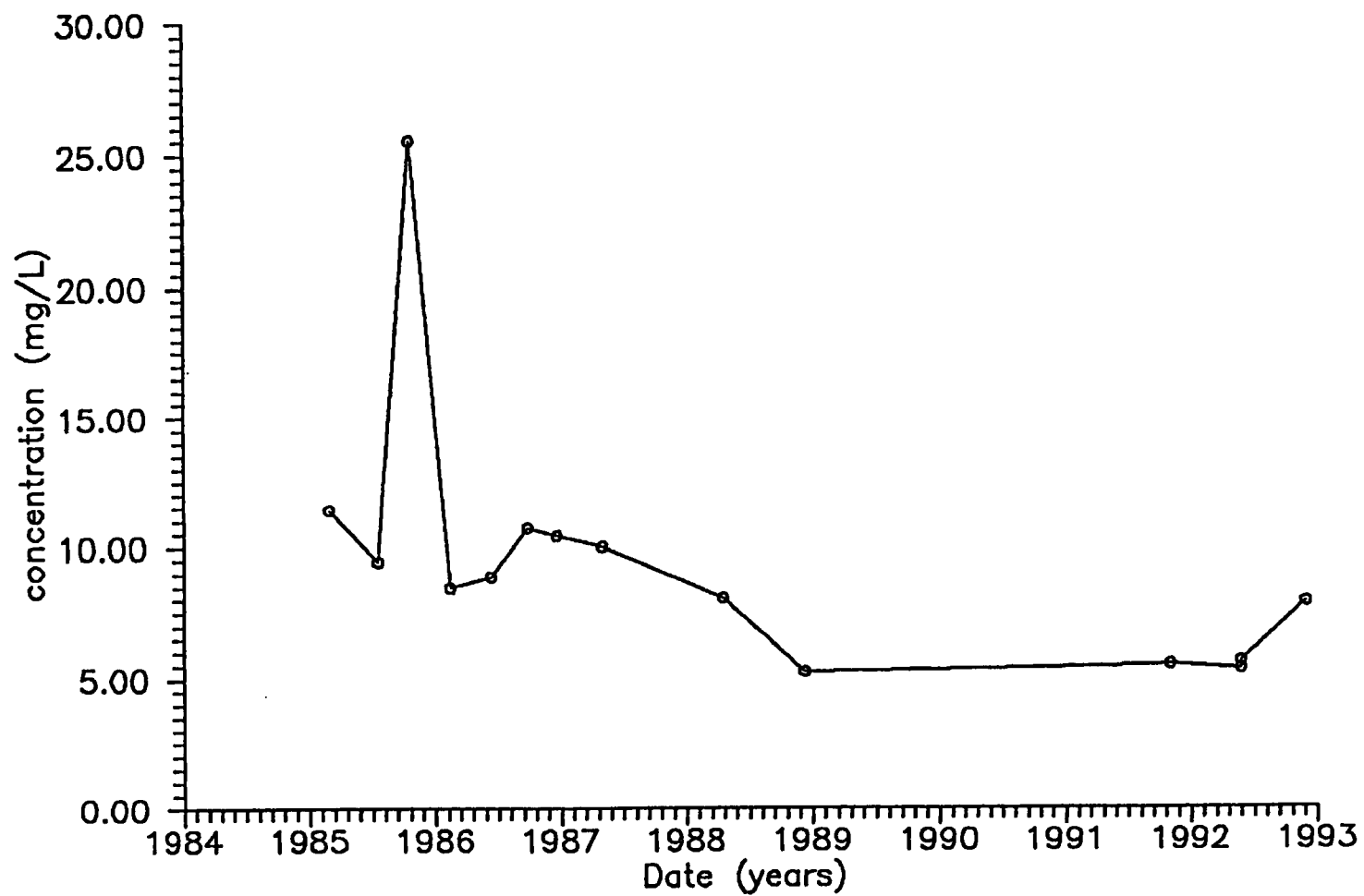


FIGURE 4-11  
NITRATE TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

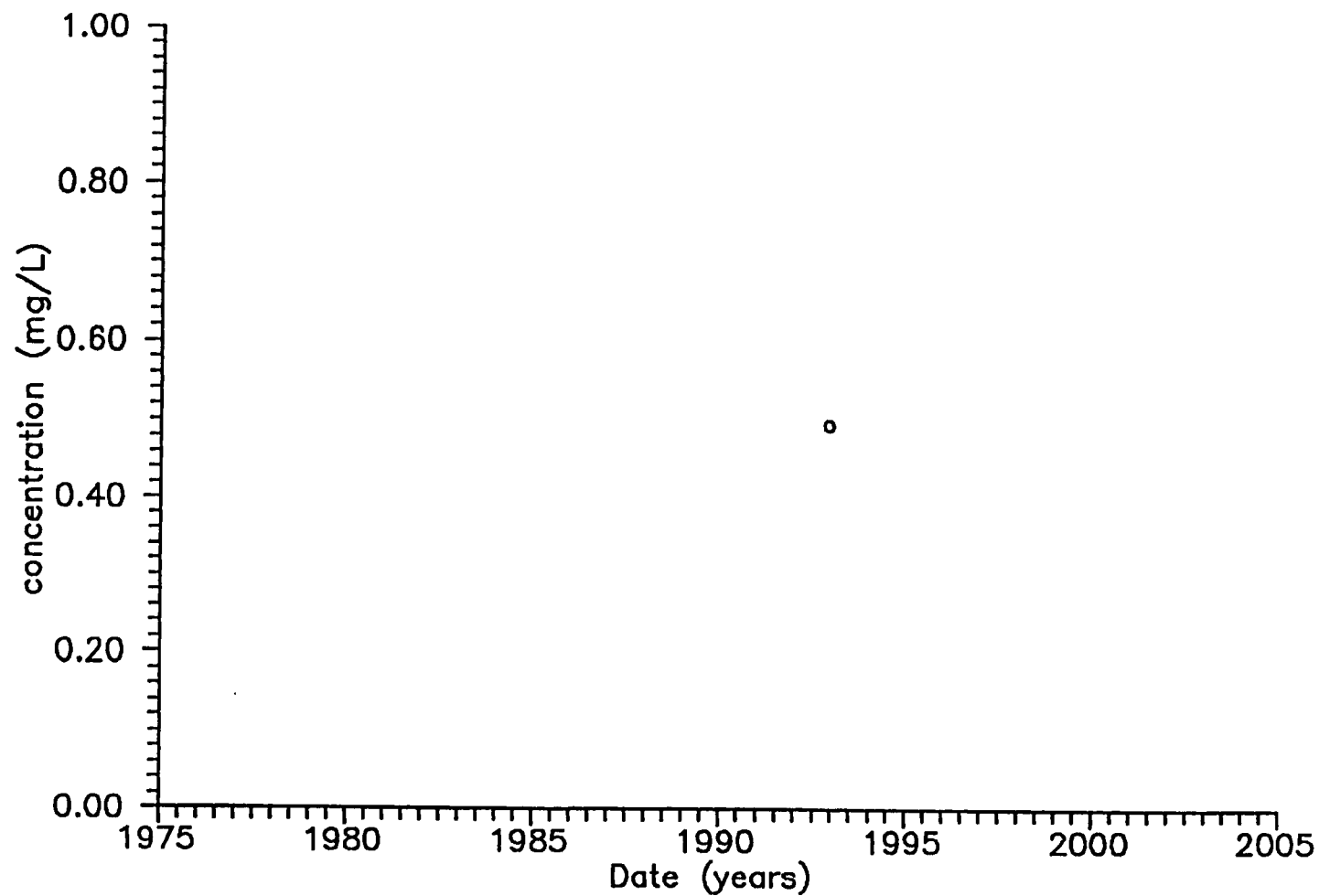


FIGURE 4-12  
SELENIUM TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II RI/ID

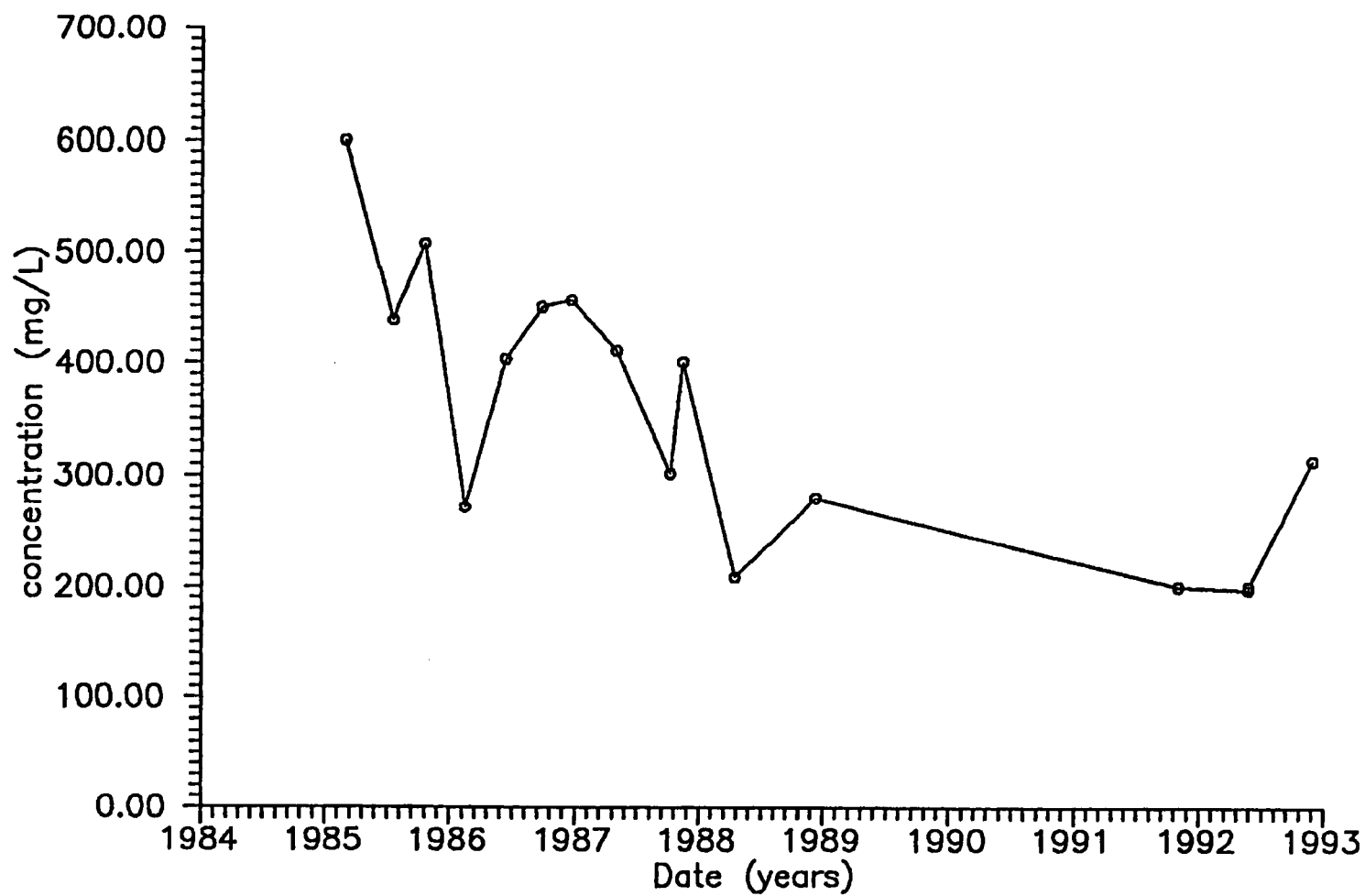


FIGURE 4-13  
SULFATE TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II R/ID

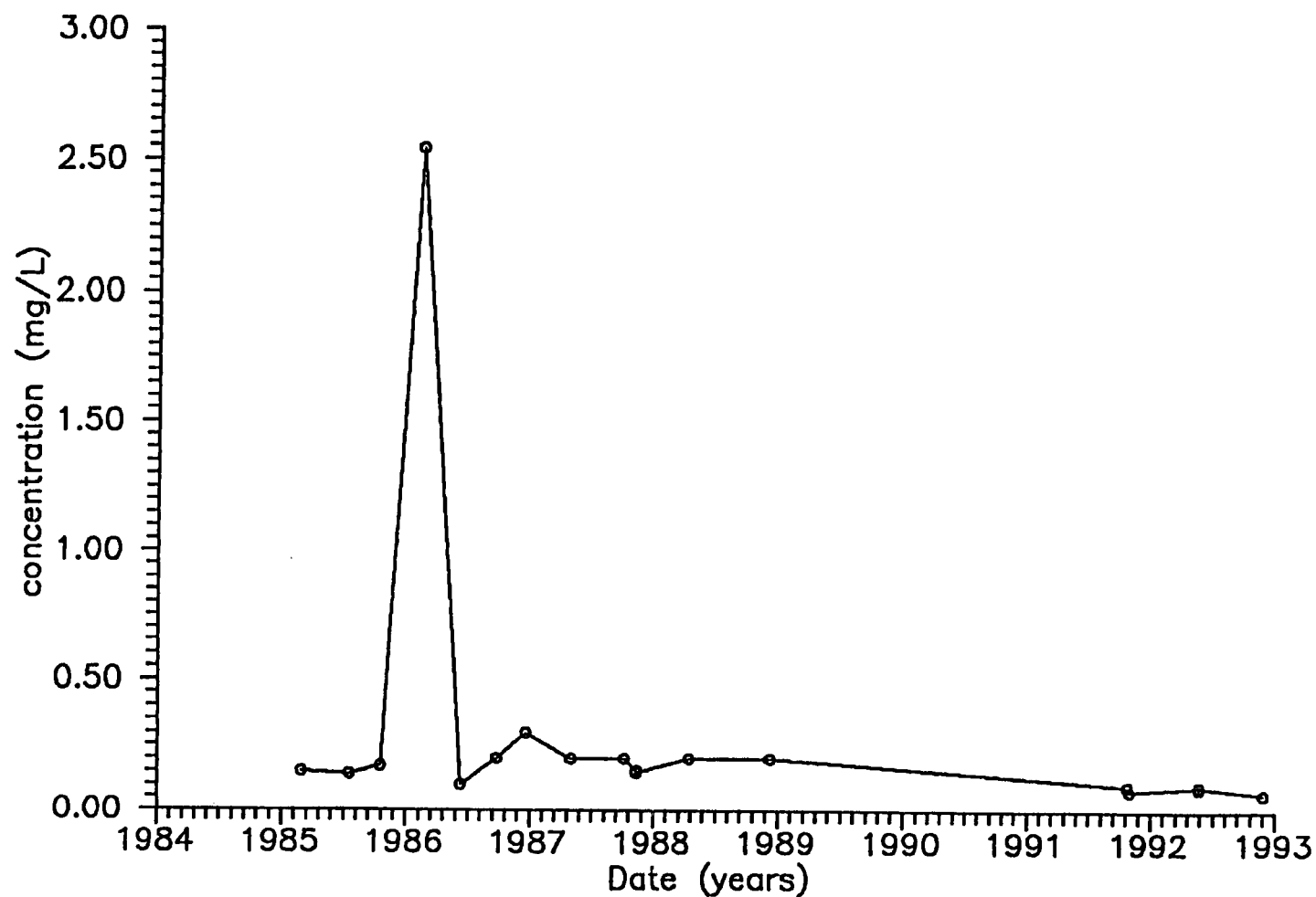


FIGURE 4-14  
VANADIUM TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II RI/ID

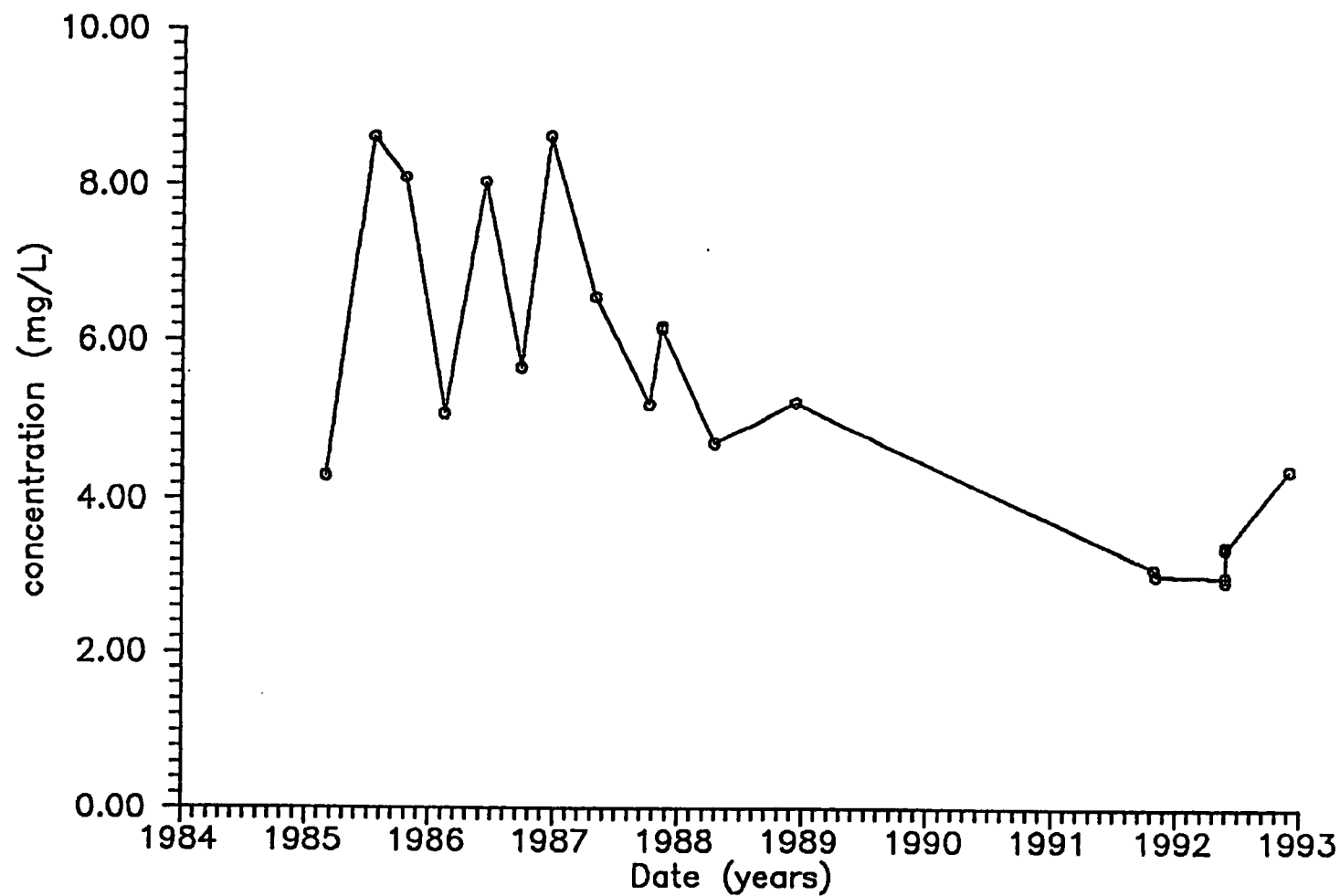


FIGURE 4-15  
ZINC TIME HISTORY  
TEST WELL 37  
MONSANTO/PHASE II RI/ID

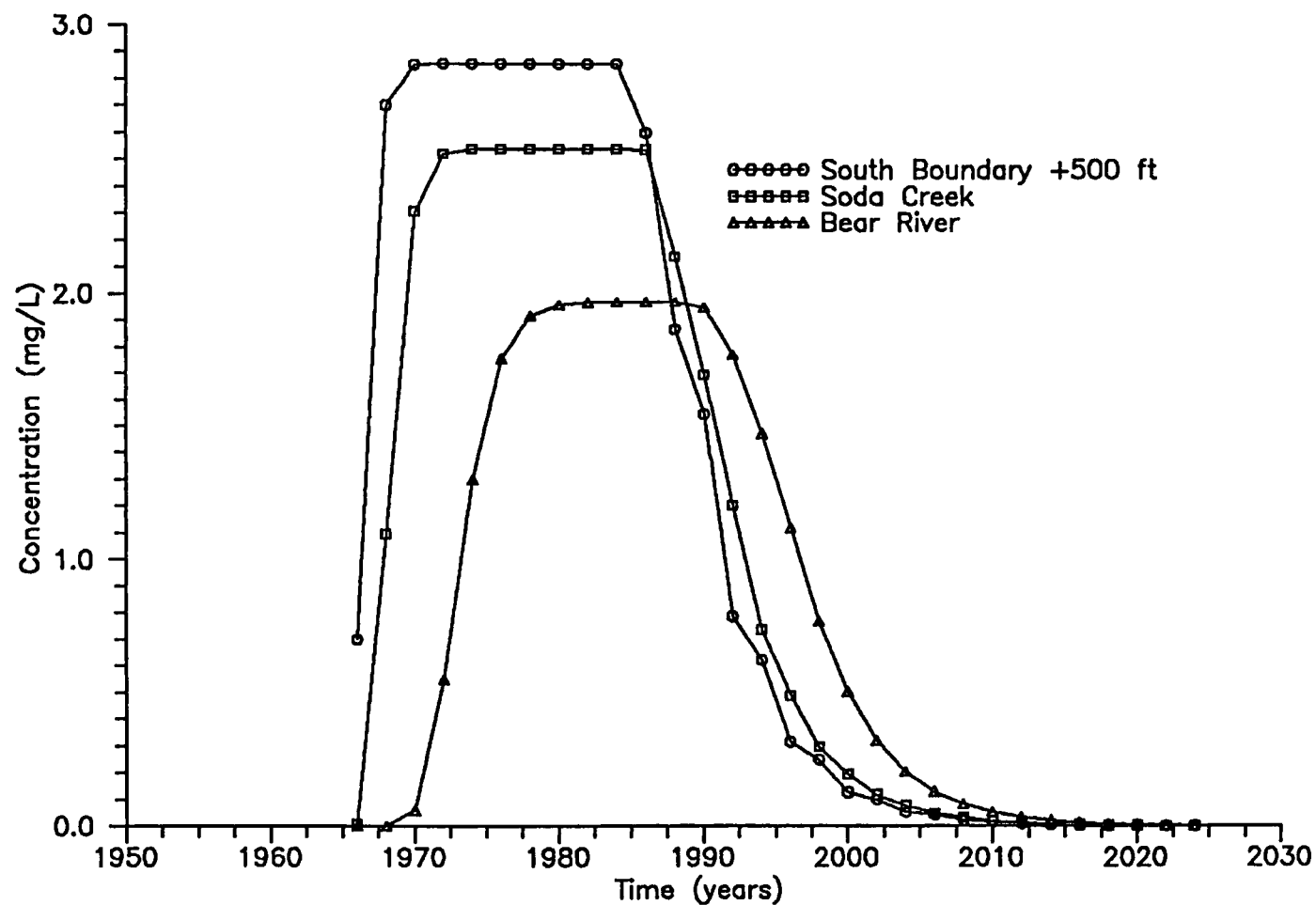


FIGURE 4-16  
 PREDICTED ALUMINUM  
 CONCENTRATIONS IN GROUNDWATER  
 MONSANTO/PHASE II RI/ID

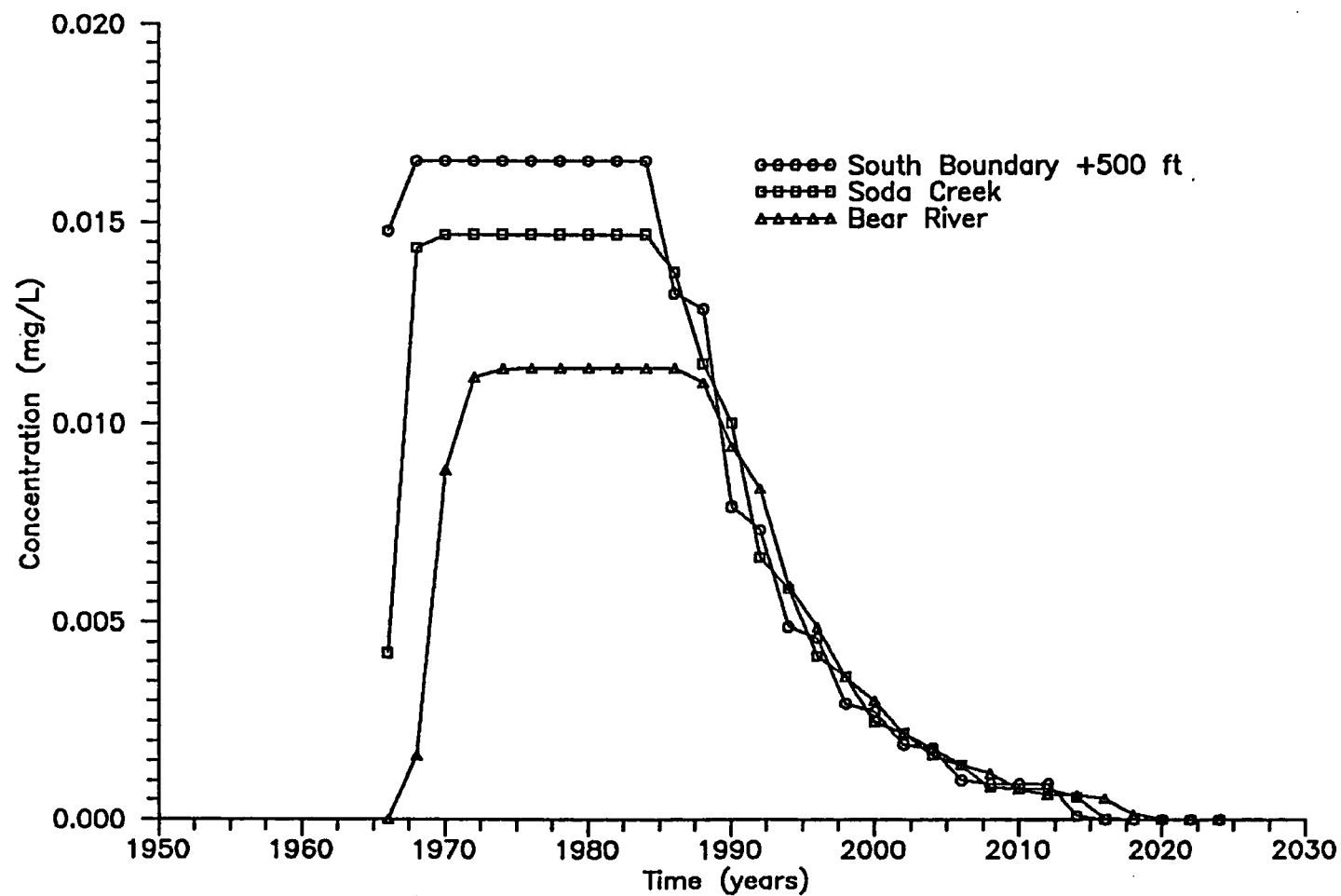


FIGURE 4-17  
**PREDICTED ARSENIC  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II R/I/D

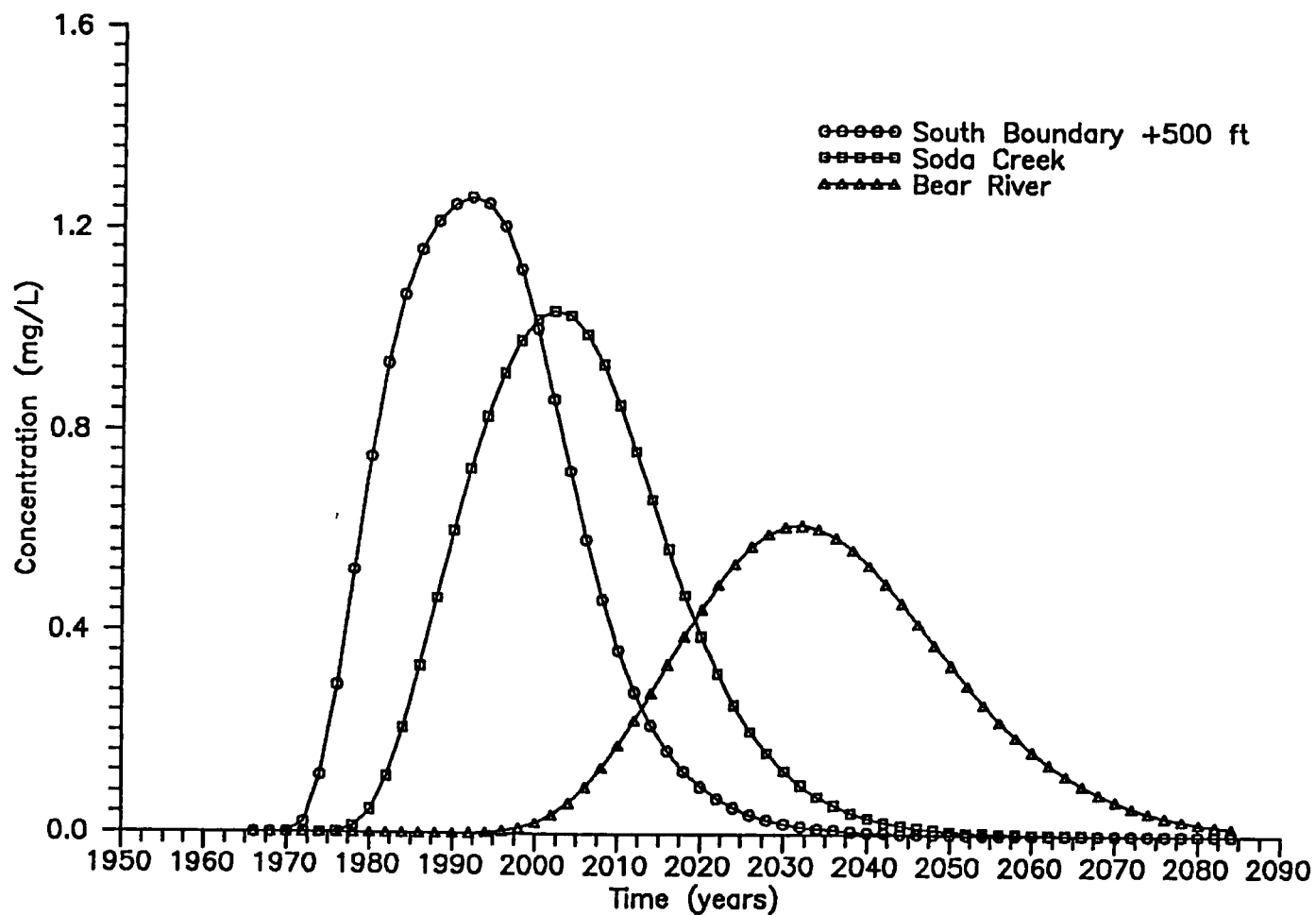


FIGURE 4-18  
**PREDICTED CADMIUM  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II R/I/D

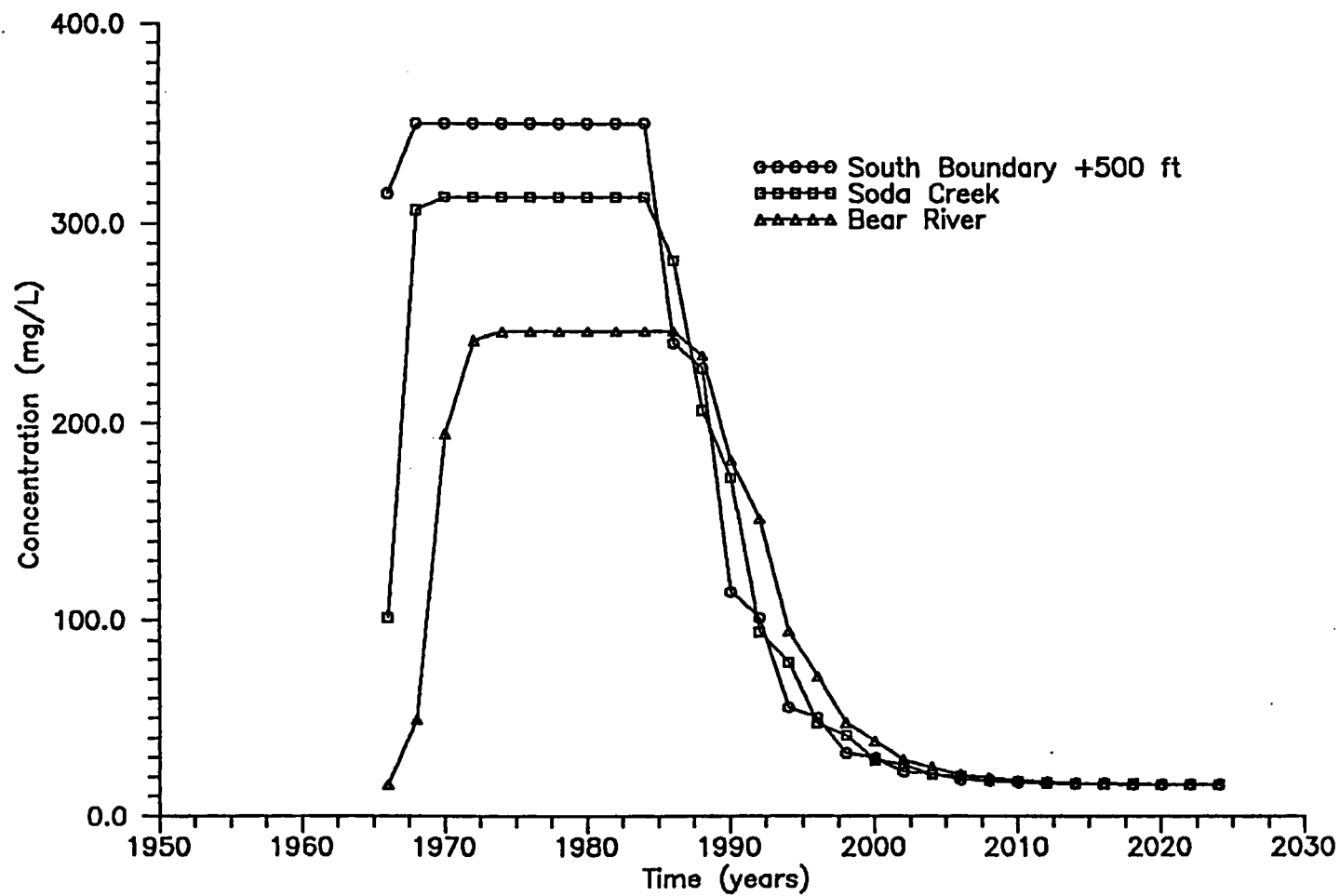


FIGURE 4-19  
**PREDICTED CHLORIDE  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II R/ID

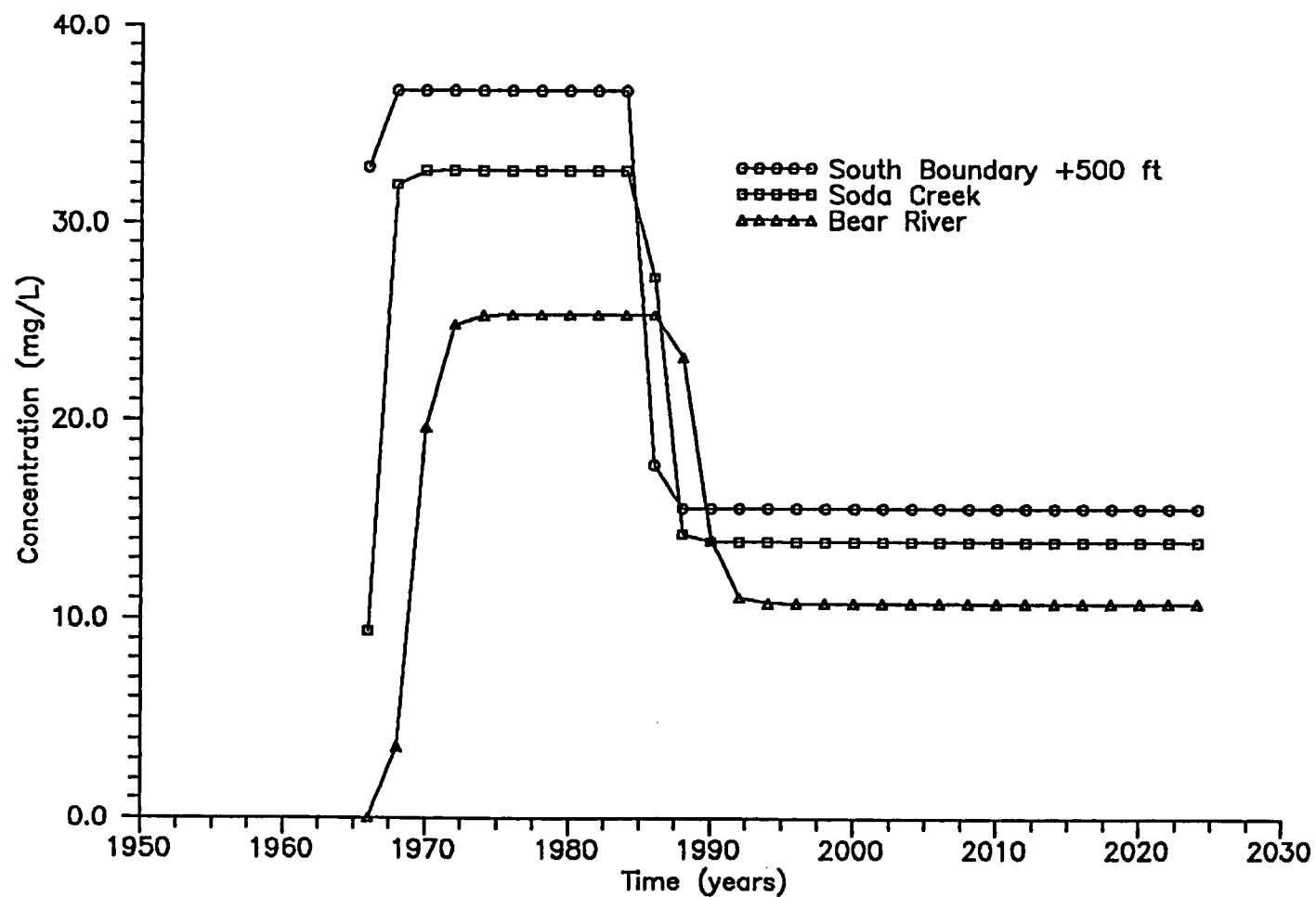


FIGURE 4-20  
**PREDICTED FLUORIDE  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II RI/ID

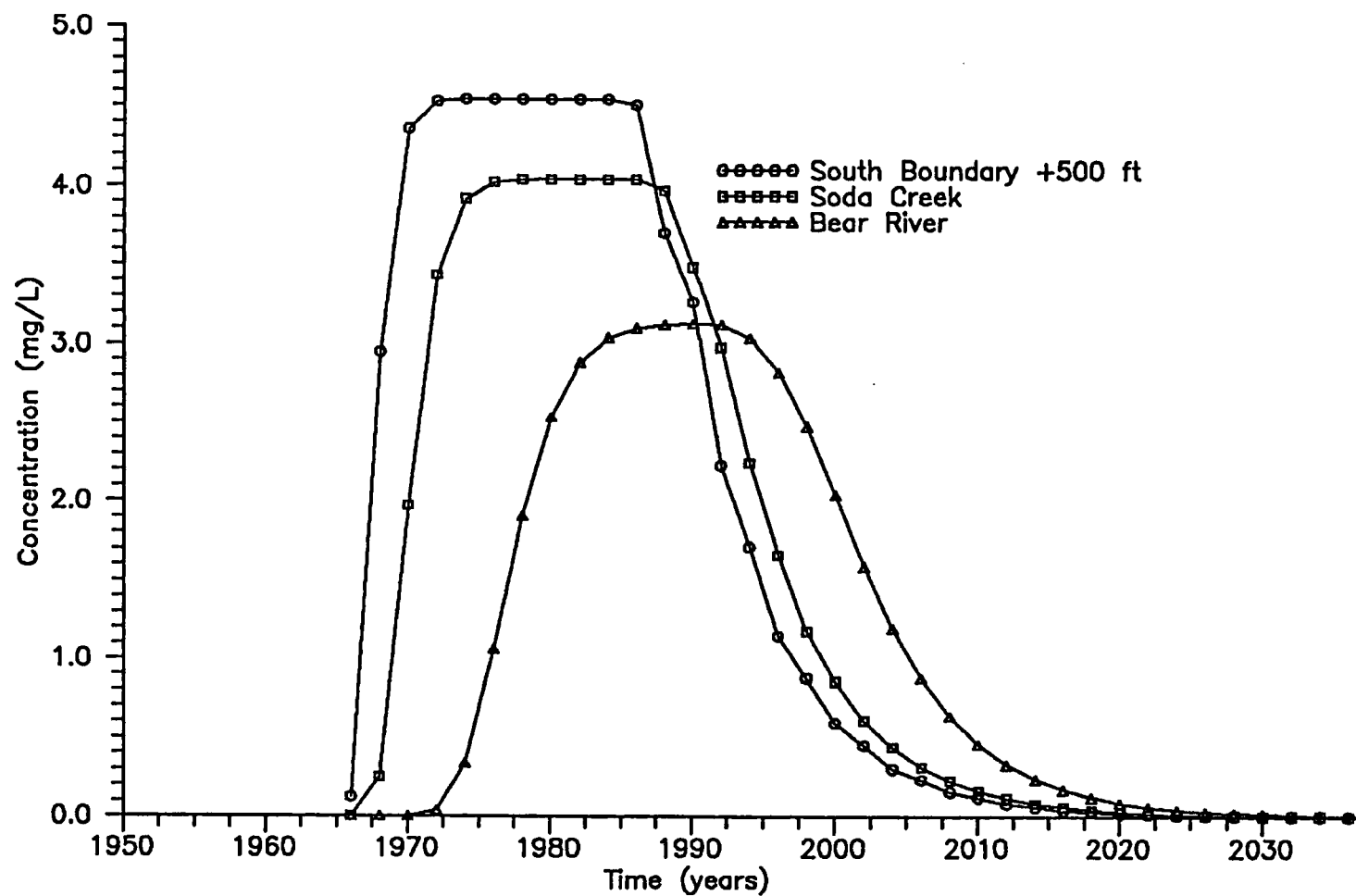


FIGURE 4-21  
**PREDICTED MANGANESE  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II R/ID

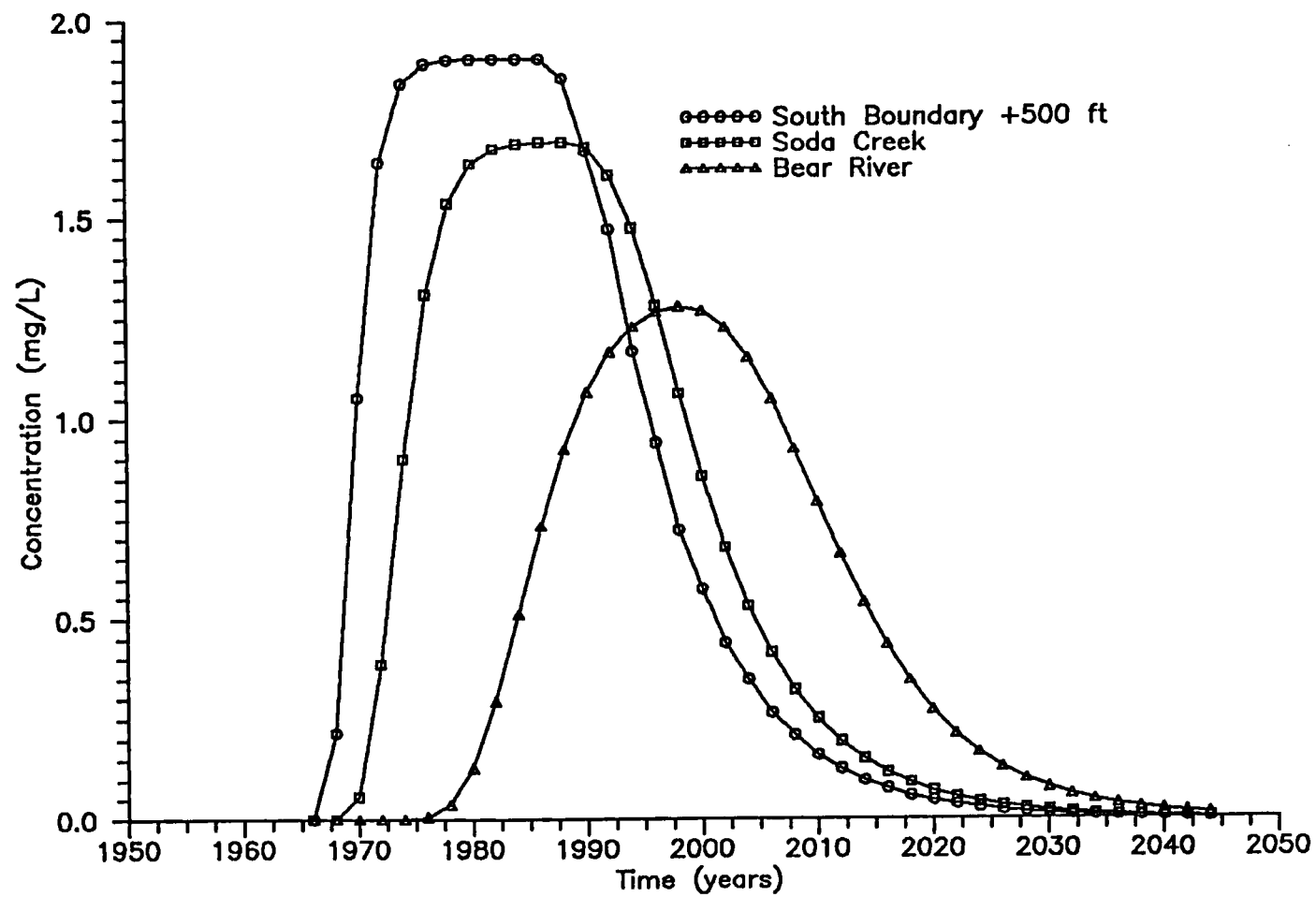


FIGURE 4-22  
**PREDICTED MOLYBDENUM  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II RI/ID

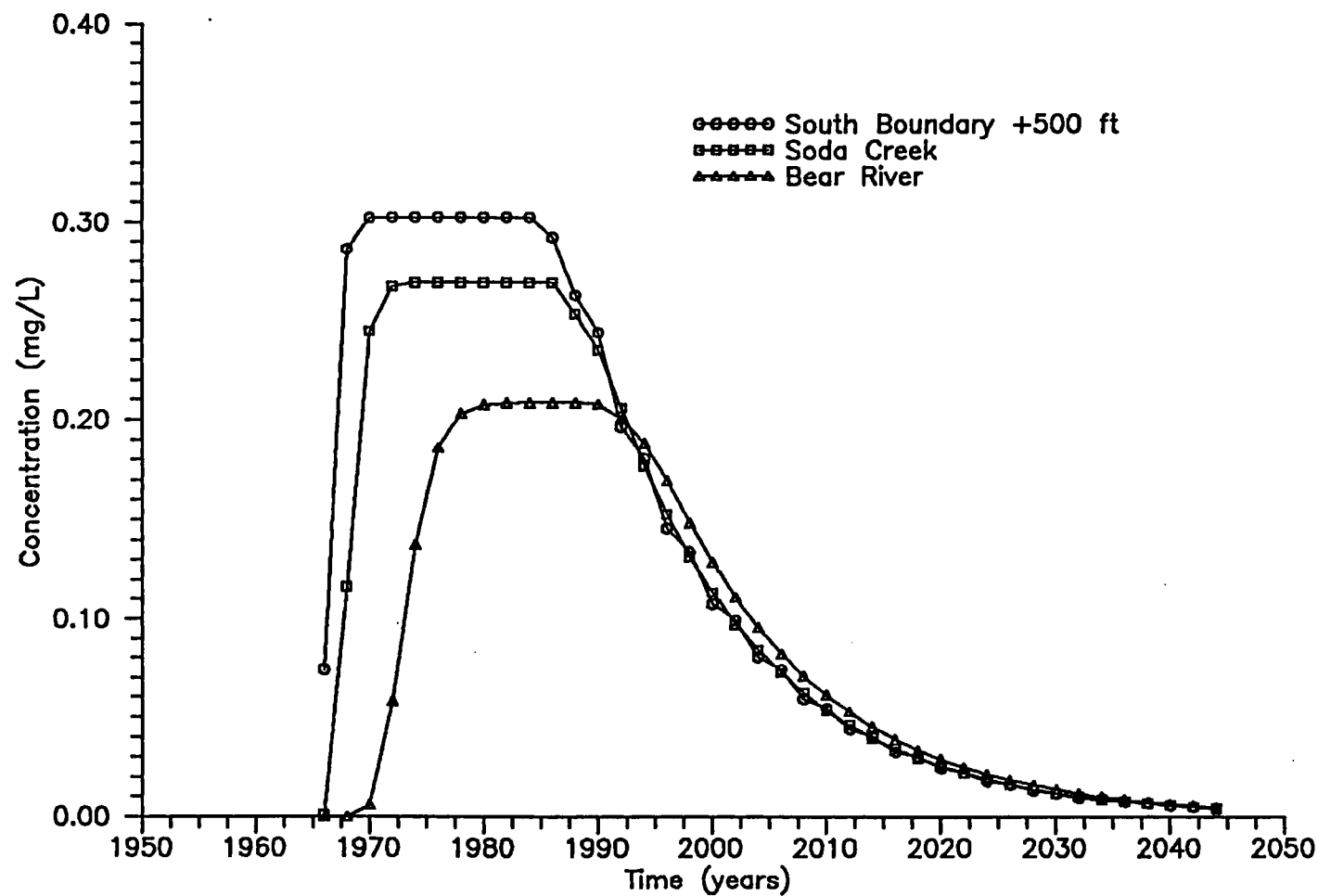


FIGURE 4-23  
PREDICTED NICKEL  
CONCENTRATIONS IN GROUNDWATER  
MONSANTO/PHASE II R/ID

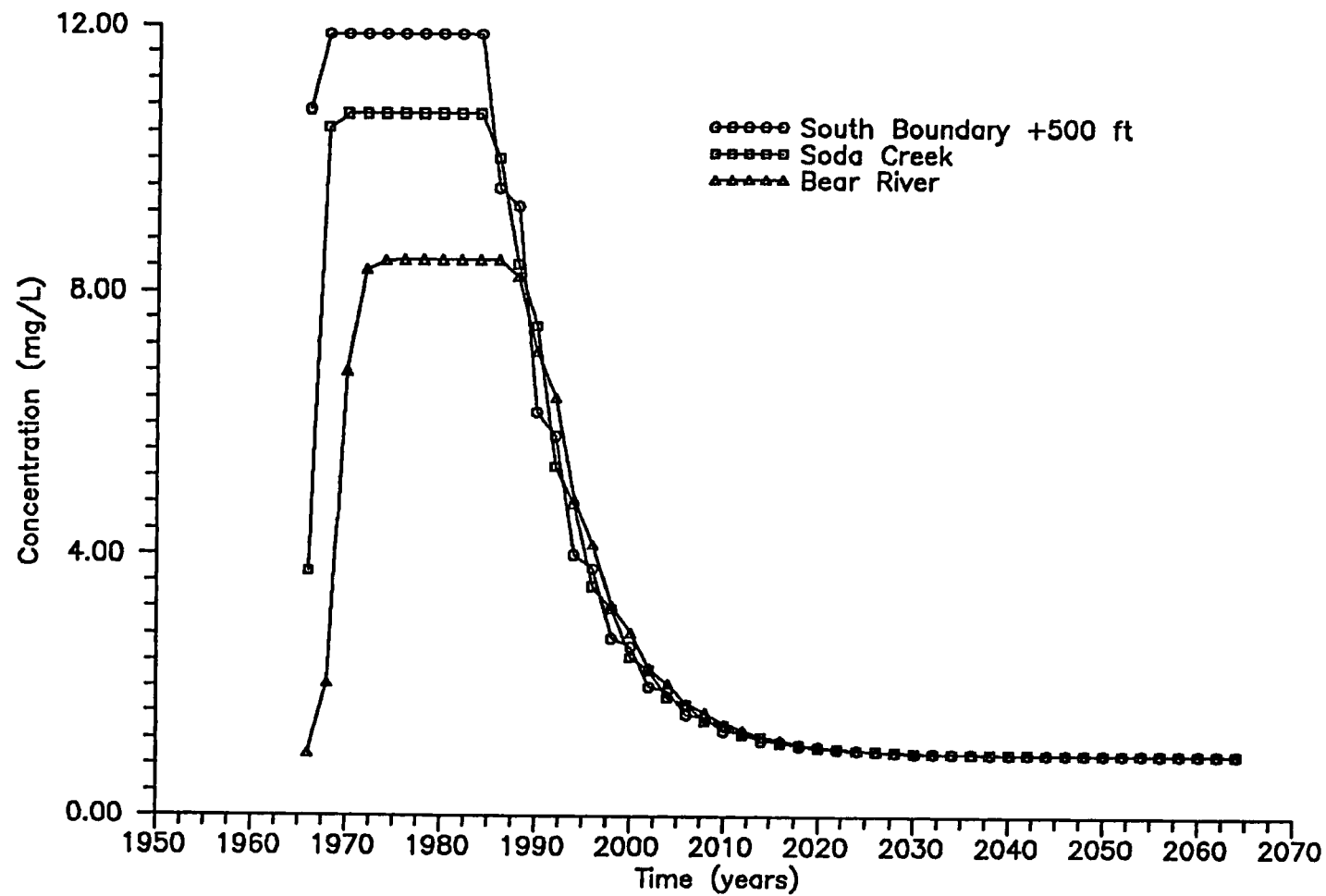


FIGURE 4-24  
PREDICTED NITRATE  
CONCENTRATIONS IN GROUNDWATER  
MONSANTO/PHASE II R/I/D

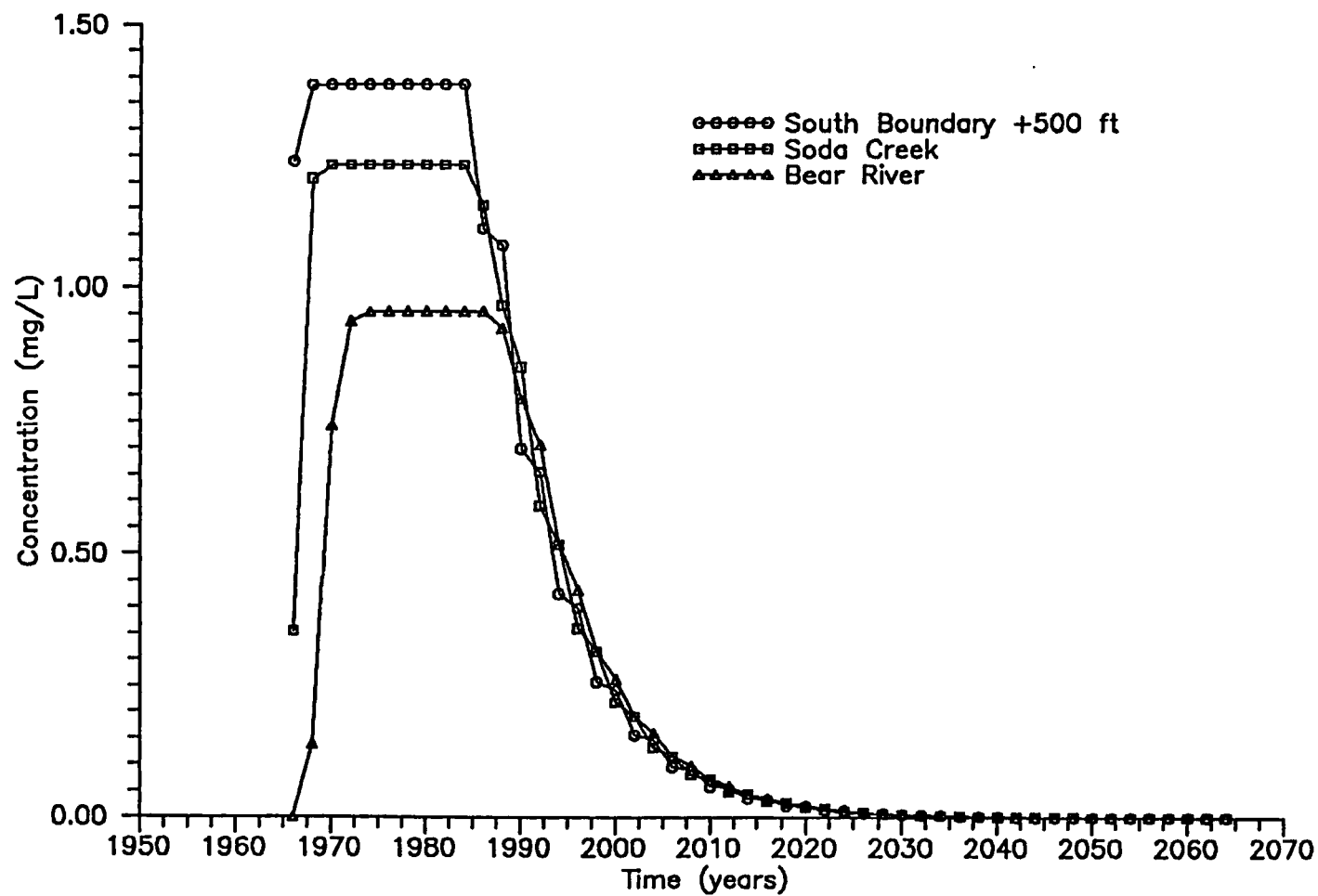


FIGURE 4-25  
PREDICTED SELENIUM  
CONCENTRATIONS IN GROUNDWATER  
MONSANTO/PHASE II RI/ID

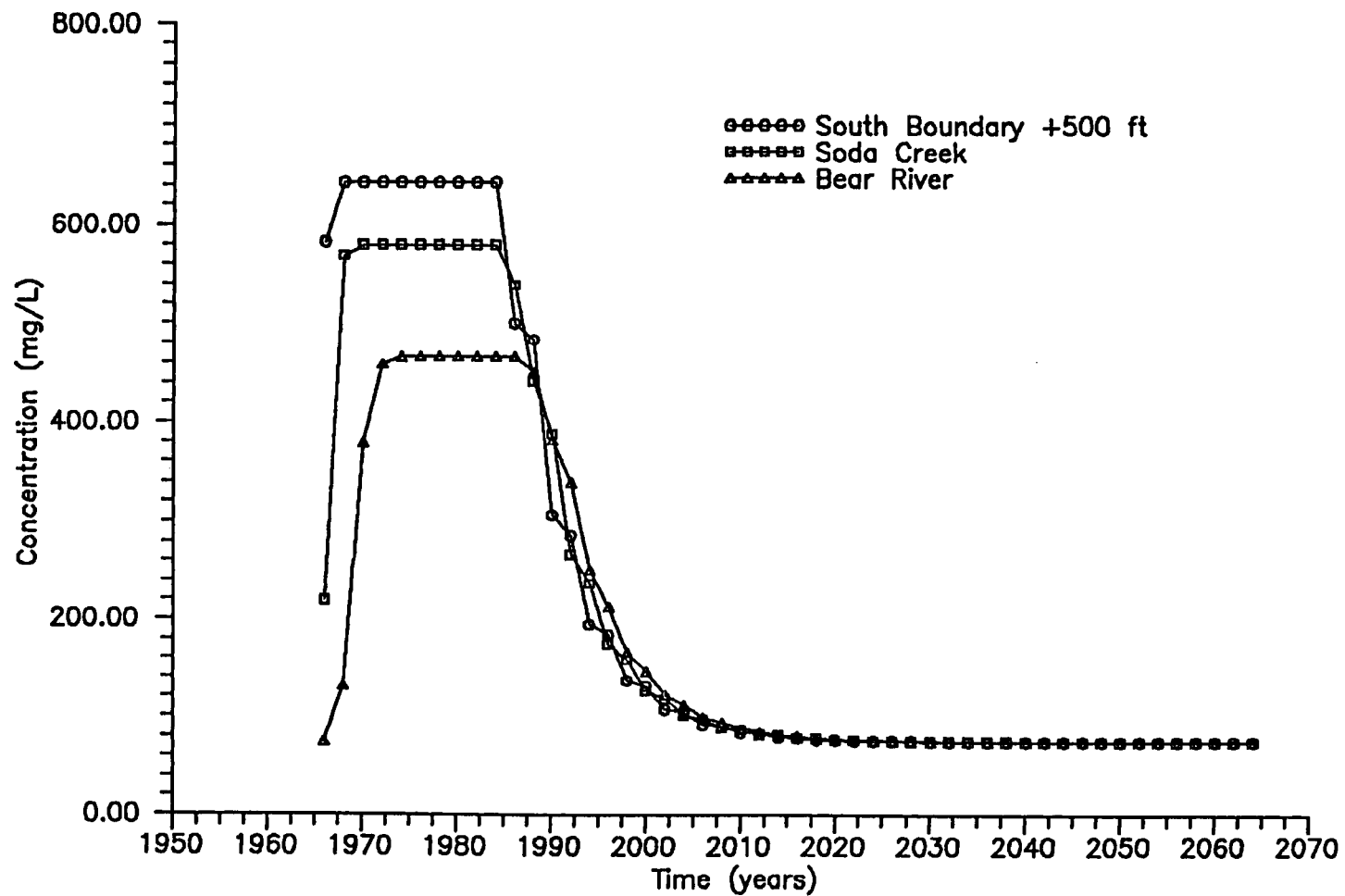


FIGURE 4-26  
**PREDICTED SULFATE  
 CONCENTRATIONS IN GROUNDWATER**  
 MONSANTO/PHASE II RI/ID

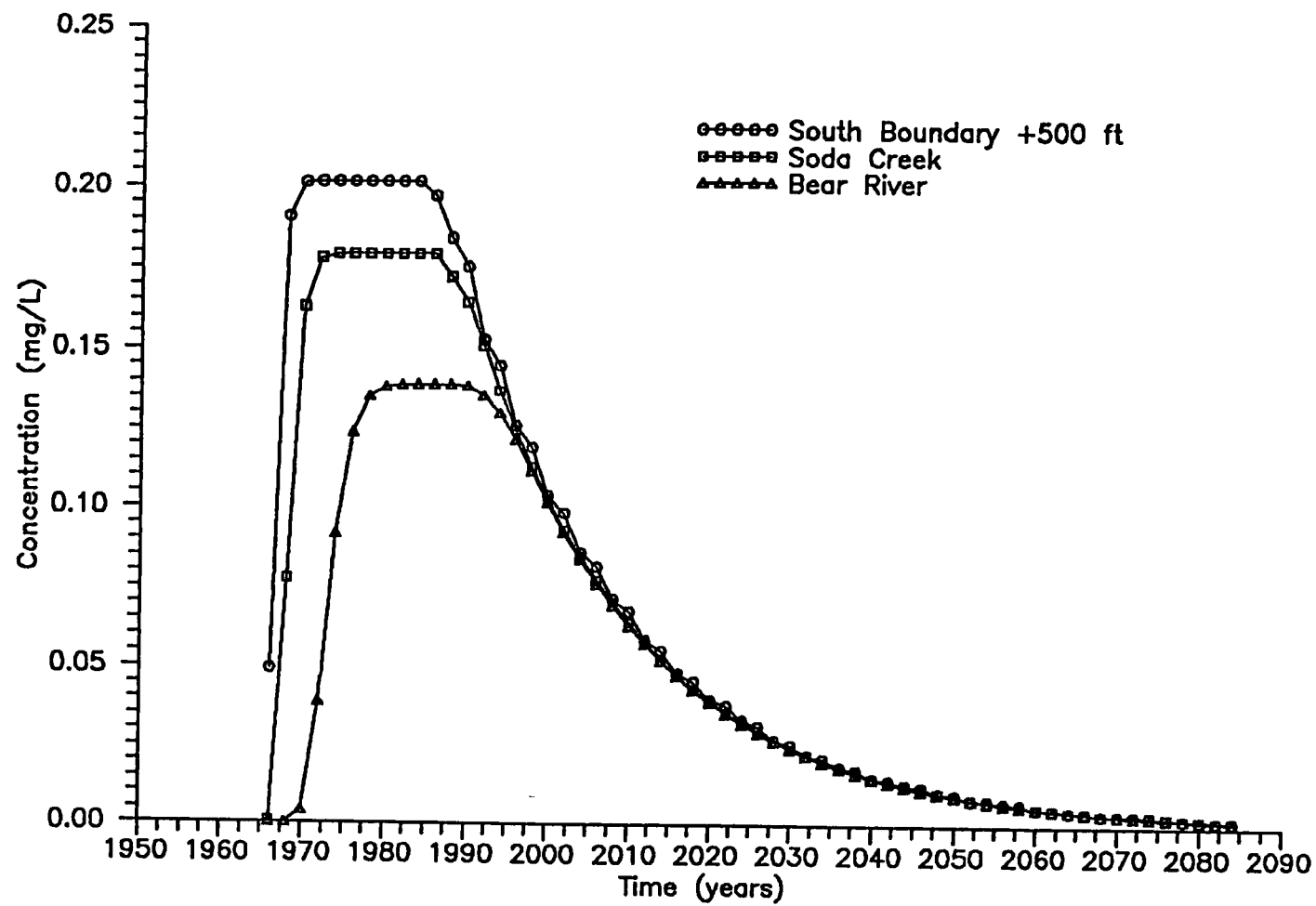


FIGURE 4-27  
PREDICTED VANADIUM  
CONCENTRATIONS IN GROUNDWATER  
MONSANTO/PHASE II R/ID

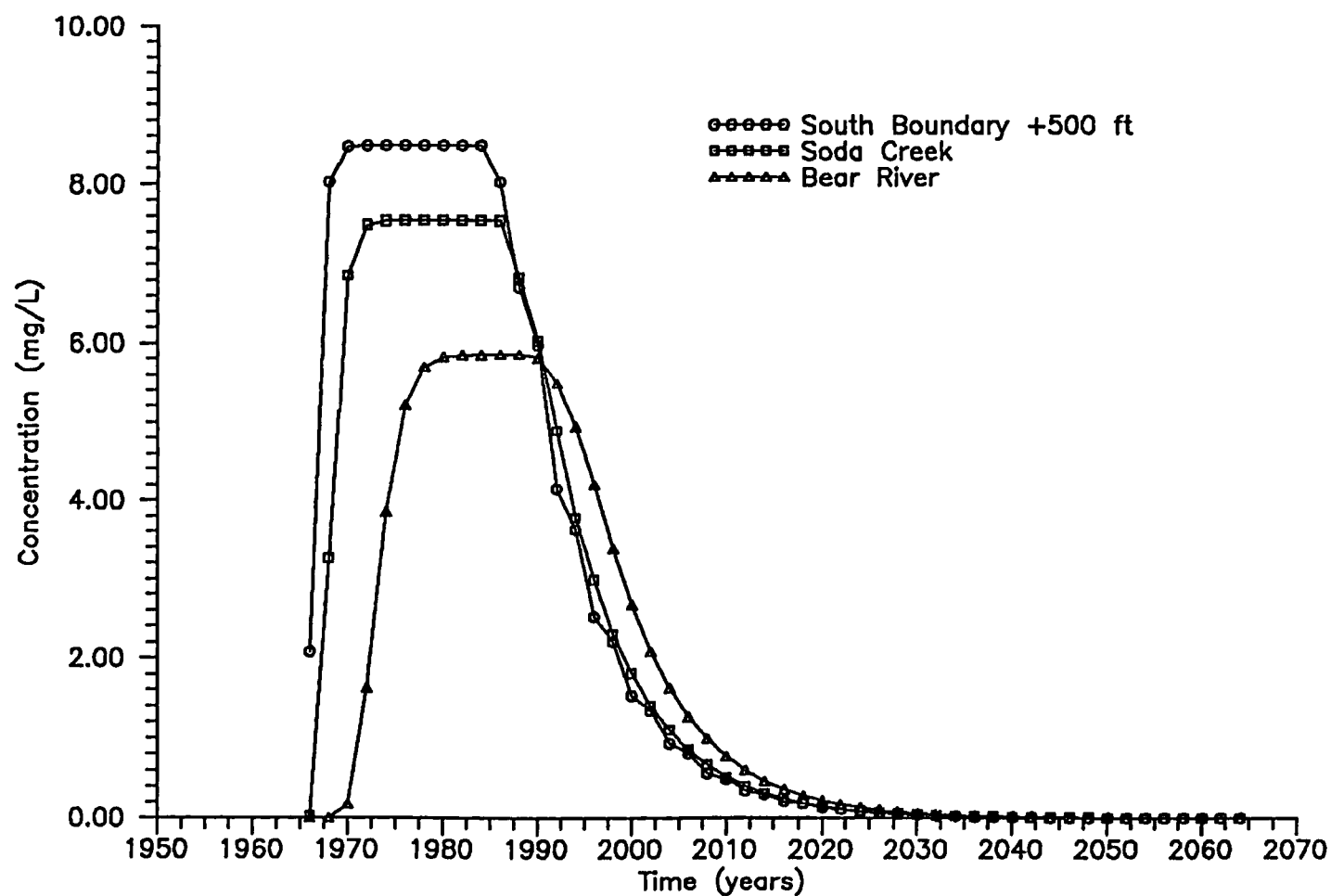


FIGURE 4-28  
 PREDICTED ZINC  
 CONCENTRATIONS IN GROUNDWATER  
 MONSANTO/PHASE II R/ID

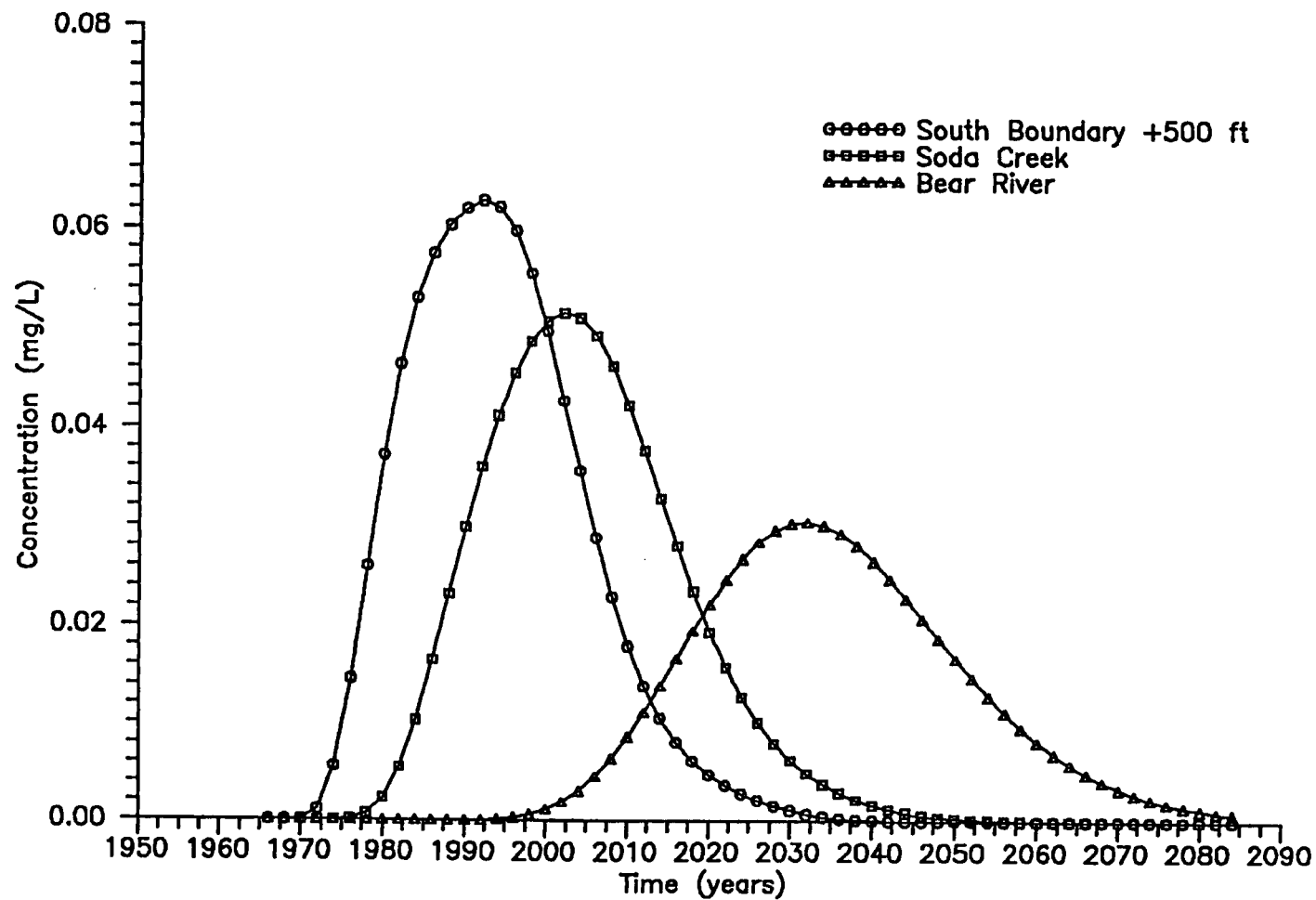


FIGURE 4-29  
 PREDICTED CADMIUM CONCENTRATIONS  
 WITH OTAVITE SOLUBILITY CONTROL  
 MONSANTO/PHASE II R/I/D

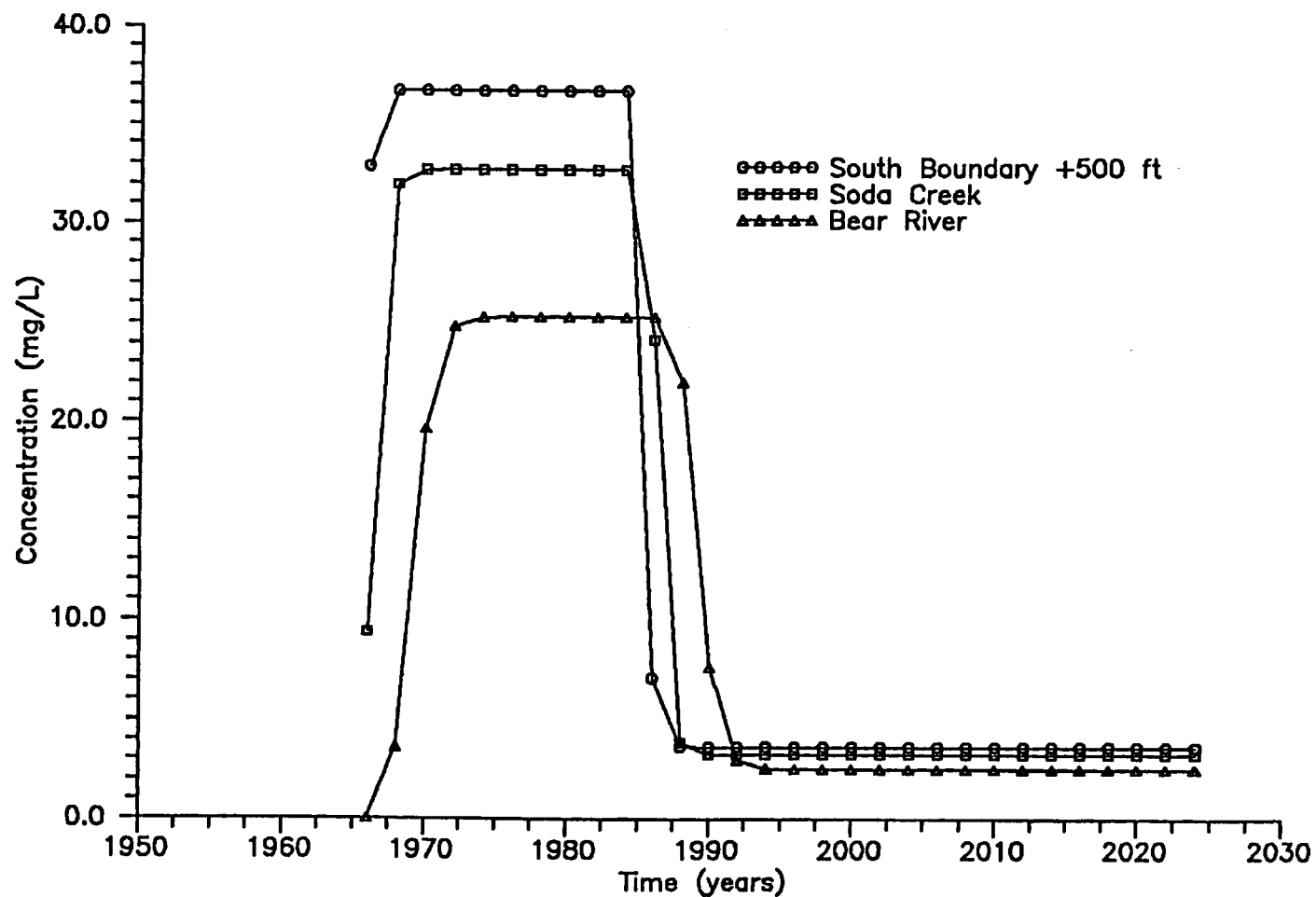


FIGURE 4-30  
 PREDICTED FLUORIDE CONCENTRATIONS WITH  
 FLUORITE SOLUBILITY CONTROL AFTER 1984  
 MONSANTO/PHASE II R/ID

APPENDIX A  
LISTING OF TRANSPORT MODEL COMPUTER PROGRAM

/\*

file: mcdom.c

MONSANTO, PHASE II RI/FS  
913-1101.605

This program solves a modified form of the Domenico (1987) solution for transport in a uniform flow field with a continuous source, Co, under transient conditions. Advection, dispersion, and retardation processes are considered.

#### PROGRAM INPUT

The program is executed by typing mcdom at the dos prompt in the directory containing the executable image mcdom.exe. The program prompts the user for two files, one containing input data and the other an output file for general program output. The input file must contain the information listed below exactly as ordered.

```
Record #1
  K, n, grad
Record #2
  alpha_l, alpha_t, R, co
Record #3
  Dt, ft, Nits
Record #4
  xs, ys, Y2, Nsrc
Record #5 (Nsrc records)
  t, c
Record #(4+Nsrc)
  Nobs
Record #6 (Nobs records)
  fn1, x1, y1, to1
  .
  .      ) Nobs records
  .
  fnN, xN, yN, toN
Record #7 (up to 30 records)
  tc[0]
  tc[1]
  .
  .
  tc[29]
```

where:

K	hydraulic conductivity (L/t)
n	effective porosity (V/V)
grad	hydraulic gradient (L/L)
alpha_l	longitudinal dispersivity (L)
alpha_t	transverse dispersivity (L)
R	retardation (-)
co	background concentration (mass/volume)
Dt	simulation time step size (t)
ft	time units conversion factor (yr/t, e.g., yr/days or 1/365 = 0.0027) (output time = yo + ft * simulation time)
Nits	number of time steps (Nits * Dt is total simulation time) if Nits < 0, discrete times are read at end of input file into array tc[]
xs, ys	continuous source location
Y2	source half-width (L)
Nsrc	number of source function segments
t	start time of source function segment (yr)
c	concentration of source function segment (mass/volume)
Nobs	number of observation locations
fn1	file name for output (t vs C) at respective location (up to 32 characters)
x1, y1	observation location coordinates
to	first time at which output will begin to be written (yr)
tc[]	array of calculation times (yr)

Note: Time data used internally by the program is converted to simulation time units (t). For example, t1 is converted to units of (t) by the expression  $t1' = (t1 - y0)/ft$ . Likewise all times specified in tc[] are converted to units of t by  $tc[i]' = (tc[i] - y0)/ft$ , etc. It is up to the user to correctly choose the units of (t) and values for y0, ft, r, tc[i], and t. Values for Dt and dt must be specified in units of L/t.

#### PROGRAM OUTPUT

Output is written to two or more files. The first output file is named by the user upon execution of the program. This file contains an echo of the input file. Additional output files contain t vs. C time history data at observation locations. Each file is named in the input file -- field fn1 -- as described above.

Golder Contact: Mark Cunnane

\*/

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
```

```
#define PI 3.1415926
#define MAXT 30
#define ITHMAX 100
#define EPS 3.E-07
```

```
typedef struct {
    float x;
    float y;
    float to;
    float c;
    FILE *fp;
    char fn[32];
    obs_t;
```

```
typedef struct {
    float t;
    float c;
    src_t;
```

```
float erf(float);
float gammp(float, float);
float gser(float, float);
float gcf(float, float);
double gammln(float);
```

```
void main()
```

```
{
```

```
/*-----
                        Declarations
```

```
*/
```

```
char    f_in[32], f_out[32];
int     Nits, Nobs, Nsrc, Nc, Nc_echo;
int     i, j, k;
float   K, n, grad, vd, vp;
float   alpha_l, alpha_t, R, co;
float   Dt, y0, ft, Y2;
float   xs, ys, ts, C;
float   tc[MAXT], t, x, y;
float   p1, p2, p3;
obs_t   *Cobs;
src_t   *Csrc;
FILE    *fin, *fout, *fopen();
```

```

/*-----
                        Read Input
-----*/

printf("\nEnter the input file name: ");
scanf("%s", f_in);
printf("\nEnter the output file name: ");
scanf("%s", f_out);

fin = fopen(f_in, "r");
fout = fopen(f_out, "w");

fscanf(fin, "%f %f %f", &K, &n, &grad);
fscanf(fin, "%f %f %f %f", &alpha_l, &alpha_t, &R, &co);
fscanf(fin, "%f %f %d", &Dt, &ft, &Nits);
fscanf(fin, "%f %f %f %d", &xs, &ys, &Y2, &Nsrc);

Csrc = (src_t *) calloc(Nsrc, sizeof(src_t));
for(i=0; i<Nsrc; i++)
    fscanf(fin, "%f %f", &Csrc[i].t, &Csrc[i].c);

fscanf(fin, "%d", &Nobs);

Cobs = (obs_t *) calloc(Nobs, sizeof(obs_t)); /* allocate memory */
for(i=0; i<Nobs; i++)
    fscanf(fin, "%s %f %f %f", Cobs[i].fn, &Cobs[i].x, &Cobs[i].y, &Cobs[i].to);

for(i=0; i<Nobs; i++)
    Cobs[i].fp = fopen(Cobs[i].fn, "w");

if(Nits < 0)
{
    i = 0;
    while(!feof(fin))
    {
        fscanf(fin, "%f", &tc[i]);
        i++;
    }
    Nc = i-1;
    Nc_echo = Nc;
}
else
{
    Nc = Nits;
    Nc_echo = 0;
}

vd = K*grad;
vp = K*grad/n;

```

```
/*-----
                        Echo Input
*/
```

```
fprintf(fout, "\nSUMMARY OF INPUT DATA FOR PROGRAM UBZPLUME\n");
fprintf(fout, "Input file: %s\n", f_in);
fprintf(fout, "\nHydrologic Data:\n");
fprintf(fout, "    Hydraulic Conductivity.....%f\n", K);
fprintf(fout, "    Hydraulic Gradient.....%f\n", grad);
fprintf(fout, "    Porosity.....%f\n", n);
fprintf(fout, "    Darcy Velocity.....%f\n", vd);
fprintf(fout, "    Seepage Velocity.....%f\n", vp);
fprintf(fout, "\nTransport Data:\n");
fprintf(fout, "    Longitudinal Dispersivity.....%f\n", alpha_l);
fprintf(fout, "    Transverse Dispersivity.....%f\n", alpha_t);
fprintf(fout, "    Retardation.....%f\n", R);
fprintf(fout, "    Transport velocity.....%f\n", vp/R);
fprintf(fout, "\nCalculation Data:\n");
fprintf(fout, "    Calculation time step.....%f\n", Dt);
fprintf(fout, "    No. of calculation steps.....%d\n", (int) max(Nits, 0));
fprintf(fout, "    No. discrete calculations.....%d\n", Nc_echo);
fprintf(fout, "\nContinuous Source Data:\n");
fprintf(fout, "    X-coordinate.....%f\n", xs);
fprintf(fout, "    Y-coordinate.....%f\n", ys);
fprintf(fout, "    background concentration.....%f\n", co);
fprintf(fout, "    source half-width.....%f\n", Y2);
fprintf(fout, "\nSource Term Function:\n");
fprintf(fout, "Segment No.    Start Concentration\n");
for(i=0; i<Nsrc; i++)
    fprintf(fout, "    %d        %f        %f\n", i, Csrc[i].t, Csrc[i].c);
fprintf(fout, "\nObservation Locations:\n");
fprintf(fout, "Location No.    X-coord        Y-coord        Output time\n");
for(i=0; i<Nobs; i++)
    fprintf(fout, "    %d        %f        %f        %f\n", i, Cobs[i].x, Cobs[i].y, Cobs[i].to);
fprintf(fout, "\nEND OF FILE");
```

```
/*-----
                        Calculations
*/
```

```
vp /= R;
yo = Csrc[0].t;
t = 0.;

for(i=0; i<Nsrc; i++)
    Csrc[i].t = (Csrc[i].t-yo)/ft;
```

```

for(i=0;i<Nc;i++)
{
    if(Nits < 0)
        t = (tc[i]-yo)/ft;
    else
        t += Dt;

    ts = Csrc[0].t;
    C = Csrc[0].c;
    for(k=0;k<Nobs;k++)
    {
        x = Cobs[k].x - xs;
        y = Cobs[k].y - ys;
        p1 = (x - vp*(t-ts))/(2.*sqrt(alpha_l*vp*(t-ts)));
        p2 = (y + Y2)/(2.*sqrt(alpha_t*x));
        p3 = (y - Y2)/(2.*sqrt(alpha_t*x));
        Cobs[k].c = C/4.*(1.-erf(p1))*(erf(p2)-erf(p3));
    }
    for(j=1;j<Nsrc;j++)
    {
        ts = Csrc[j].t;
        C = Csrc[j].c-Csrc[j-1].c;
        if(t <= ts) continue;
        for(k=0;k<Nobs;k++)
        {
            x = Cobs[k].x - xs;
            y = Cobs[k].y - ys;
            p1 = (x - vp*(t-ts))/(2.*sqrt(alpha_l*vp*(t-ts)));
            p2 = (y + Y2)/(2.*sqrt(alpha_t*x));
            p3 = (y - Y2)/(2.*sqrt(alpha_t*x));
            Cobs[k].c += C/4.*(1.-erf(p1))*(erf(p2)-erf(p3));
        }
    }
    /* loop for source function segments */

    for(k=0;k<Nobs;k++)
        if(yo+ft*t >= Cobs[k].to)
            fprintf(Cobs[k].fp," %f  %e\n", yo+ft*t, co+Cobs[k].c);

} /* time loop */

for(i=0;i<Nobs;i++)
    fclose(Cobs[i].fp);

fclose(fin);
fclose(fout);

return;
}

```

/\* Error Function--erf(x)

Program algorithms are those provided in Numerical Recipes (1986) in FORTRAN (page 160). The algorithms were translated to C from FORTRAN. Program output was tested against values from Table 7.1 in Abramowitz and Stegun (Ninth Printing) for 5 values. Results were 100% accurate to 4 decimal digits and approximately 60% accurate to 5 decimal digits. Where the program output deviated from Table 7.1, differences were no greater than 1.0E-05.

M. Cunnane

June 15, 1990 \*/

```
float erf(float x)
{
    float val;

    if(x < 0.0)
        val = -gammp(0.5,pow(x,2));
    else
        val = gammp(0.5,pow(x,2));
    return val;
}

float gammp(float a, float x)
{
    float val;

    if(x < 0. || a < 0.)
    {
        printf("Error in function gammp(a,x)\n");
        exit(0);
    }
    if(x < a + 1.)
        val = gser(a, x);
    else
        val = 1. - gcf(a, x);
    return val;
}

float gser(float a, float x)
{
    float ap, sum, del, gln, val;
    int i;

    if(x < 0.)
    {
        printf("Error in function gser(a, x)\n");
        exit(0);
    }

    i = 1;
    gln = (float) gammln(a);
    ap = a;
    sum = 1. / a;
    del = sum;
    while(fabs(del) > fabs(sum) * EPS && i < ITMAX)
    {
        i += 1;
        ap += 1;
        del *= x / ap;
        sum += del;
    }
    if(i >= ITMAX)
    {
        printf("Convergence error in function gser(a, x)\n");
        exit(0);
    }
    val = sum * exp(-x + a * log(x) - gln);
    return val;
}
```

```

float gcf(float a, float x)
{
    float a0, a1, b0, b1, gln;
    float an, ana, anf, fac, g, gold, val;
    int i;

    gln = (float) gamln(a);

    i = 0;
    g = 1.;
    gold = 0.;
    a0 = 1.;
    a1 = x;
    b0 = 0.;
    b1 = 1.;
    fac = 1.;
    while(fabs((g - gold) / g) > EPS && i < ITMAX)
    {
        i += 1;
        gold = g;
        an = (float) i;
        ana = an - a;
        a0 = (a1 + a0 * ana) * fac;
        b0 = (b1 + b0 * ana) * fac;
        anf = an * fac;
        a1 = x * a0 + anf * a1;
        b1 = x * b0 + anf * b1;
        if(a1 != 0.)
        {
            fac = 1. / a1;
            g = b1 * fac;
        }
    }
    if(i >= ITMAX || i <= 1)
    {
        printf("Convergence error in function gcf(a, x)\n");
        printf("%5d iterations were completed\n", i);
        exit(0);
    }
    val = exp(-x + a * log(x) - gln) * g;
    return val;
}

double gamln(float a)
{
    int i;
    double x, tmp, ser, val;
    static double cof[6] = {76.18009173,
                           -86.50532033,
                           24.01409822,
                           -1.231739516,
                           0.120858003E-02,
                           -0.536382E-05};

    static double stp = 2.50662827465;

    x = a - 1.;
    tmp = x + 5.5;
    tmp = (x + 0.5) * log(tmp) - tmp;
    ser = 1.;
    for(i = 0; i <= 5; i++)
    {
        x += 1.;
        ser += cof[i] / x;
    }
    val = tmp + log(stp * ser);
    return val;
}

```

APPENDIX B  
LISTING OF FLOWPATH GROUNDWATER MODEL INPUT

```

*****
*                                     *
*               E C H O P R I N T   *
*                                     *
*               F L O W P A T H     *
*               version 3.0         *
*                                     *
* FLOWPATH was written by Thomas Franz and Nilson Guiguer *
*                                     *
*****
*                                     *
*               Copyright 1989, 1990 *
*               by                   *
* Waterloo Hydrogeologic Software   *
* 113-106 Seagram Drive            *
* Waterloo, Ontario                *
* N2L 3B8, Canada                  *
*                                     *
*               ph (519) 746-1798    *
*                                     *
*****

```

FLOWPATH logbook for data set : REGIONAL

Unit System : English units [ft/gal/d]

\*\*\*\*\* GRID PARAMETERS \*\*\*\*\*

Number of x-grid lines : 24

Number of y-grid lines : 40

Grid coordinates (x-grid lines) [ft] :

1	0.00000E+00
2	2.60870E+03
3	5.21739E+03
4	7.82609E+03
5	1.04348E+04
6	1.30435E+04
7	1.56522E+04
8	1.82609E+04
9	2.08696E+04
10	2.34783E+04
11	2.60870E+04
12	2.86957E+04
13	3.13043E+04
14	3.39130E+04
15	3.65217E+04
16	3.91304E+04
17	4.17391E+04
18	4.43478E+04
19	4.69565E+04
20	4.95652E+04
21	5.21739E+04
22	5.47826E+04
23	5.73913E+04
24	6.00000E+04

Grid coordinates (y-grid lines) [ft] :

1	0.00000E+00
2	2.56410E+03
3	5.12821E+03
4	7.69231E+03
5	1.02564E+04
6	1.28205E+04
7	1.53846E+04

8	1.79487E+04
9	2.05128E+04
10	2.30769E+04
11	2.56410E+04
12	2.82051E+04
13	3.07692E+04
14	3.33333E+04
15	3.58974E+04
16	3.84615E+04
17	4.10256E+04
18	4.35897E+04
19	4.61538E+04
20	4.87179E+04
21	5.12821E+04
22	5.38462E+04
23	5.64103E+04
24	5.89744E+04
25	6.15385E+04
26	6.41026E+04
27	6.66667E+04
28	6.92308E+04
29	7.17949E+04
30	7.43590E+04
31	7.69231E+04
32	7.94872E+04
33	8.20513E+04
34	8.46154E+04
35	8.71795E+04
36	8.97436E+04
37	9.23077E+04
38	9.48718E+04
39	9.74359E+04
40	1.00000E+05

\*\*\*\*\* WELL PARAMETERS \*\*\*\*\*

Number of wells : 11

No.	i	j	X [ft]	Y [ft]	well discharge [gpd]
1	12	23	2.87611E+04	5.64159E+04	-2.00000E+06
2	11	23	2.61062E+04	5.64159E+04	-2.00000E+06
3	10	22	2.34513E+04	5.37611E+04	-2.00000E+06
4	10	21	2.34513E+04	5.13274E+04	-2.00000E+06
5	9	20	2.07965E+04	4.86726E+04	-2.00000E+06
6	16	16	3.91593E+04	3.84956E+04	3.20000E+06
7	14	13	3.38496E+04	3.07522E+04	-3.33000E+06
8	17	16	4.18142E+04	3.84956E+04	3.20000E+06
9	17	17	4.18142E+04	4.09292E+04	3.20000E+06
10	16	17	3.91593E+04	4.09292E+04	3.20000E+06
11	13	16	3.11947E+04	3.84956E+04	-2.00000E+06

\*\*\*\*\* CONSTRAINED HEAD NODES \*\*\*\*\*

Number of constant head nodes : 10

No.	i	j	X [ft]	Y [ft]	const. head [ft]
1	14	38	3.38496E+04	9.49115E+04	6.13000E+03
2	15	38	3.65044E+04	9.49115E+04	6.13000E+03
3	11	36	2.61062E+04	8.98230E+04	6.13000E+03
4	12	37	2.87611E+04	9.22566E+04	6.13000E+03
5	13	37	3.11947E+04	9.22566E+04	6.13000E+03
6	16	37	3.91593E+04	9.22566E+04	6.13000E+03
7	16	36	3.91593E+04	8.98230E+04	6.13000E+03
8	7	11	1.57080E+04	2.56637E+04	5.71500E+03
9	8	11	1.83628E+04	2.56637E+04	5.71500E+03
10	9	10	2.07965E+04	2.30088E+04	5.71500E+03

\*\*\*\*\* SPECIFIED FLUX NODES \*\*\*\*\*

Number of flux nodes : 52

No.	i	j	X [ft]	Y [ft]	nodal flow [ft <sup>3</sup> /ft <sup>2</sup> /d]
1	19	32	4.69027E+04	7.94248E+04	1.00000E+00
2	19	31	4.69027E+04	7.69912E+04	1.00000E+00
3	10	6	2.34513E+04	1.28319E+04	-5.00000E+00
4	19	29	4.69027E+04	7.19027E+04	1.00000E+00
5	12	4	2.87611E+04	7.74336E+03	-3.00000E+00
6	18	28	4.42478E+04	6.92478E+04	1.00000E+00
7	20	4	4.95575E+04	7.74336E+03	-1.00000E+00
8	19	4	4.69027E+04	7.74336E+03	-1.00000E+00
9	18	3	4.42478E+04	5.08850E+03	-1.00000E+00
10	17	3	4.18142E+04	5.08850E+03	-2.00000E+00
11	16	3	3.91593E+04	5.08850E+03	-2.00000E+00
12	15	4	3.65044E+04	7.74336E+03	-2.00000E+00
13	14	4	3.38496E+04	7.74336E+03	-3.00000E+00
14	13	4	3.11947E+04	7.74336E+03	-3.00000E+00
15	18	21	4.42478E+04	5.13274E+04	2.00000E+00
16	10	7	2.34513E+04	1.54867E+04	-6.00000E+00
17	17	20	4.18142E+04	4.86726E+04	2.00000E+00
18	17	19	4.18142E+04	4.62389E+04	2.00000E+00
19	10	9	2.34513E+04	2.05752E+04	-8.00000E+00
20	10	8	2.34513E+04	1.79204E+04	-7.00000E+00
21	18	17	4.42478E+04	4.09292E+04	2.00000E+00
22	18	16	4.42478E+04	3.84956E+04	2.00000E+00
23	18	25	4.42478E+04	6.15044E+04	1.00000E+00
24	19	15	4.69027E+04	3.58407E+04	2.00000E+00
25	4	22	7.74336E+03	5.37611E+04	1.00000E+00
26	19	13	4.69027E+04	3.07522E+04	2.00000E+00
27	19	23	4.69027E+04	5.64159E+04	1.00000E+00
28	20	12	4.95575E+04	2.80973E+04	2.00000E+00
29	20	11	4.95575E+04	2.56637E+04	2.00000E+00
30	11	4	2.61062E+04	7.74336E+03	-3.00000E+00
31	18	27	4.42478E+04	6.65929E+04	1.00000E+00
32	21	9	5.22124E+04	2.05752E+04	2.00000E+00
33	19	24	4.69027E+04	5.90708E+04	1.00000E+00
34	22	8	5.48673E+04	1.79204E+04	2.00000E+00
35	22	7	5.48673E+04	1.54867E+04	2.00000E+00
36	5	21	1.03982E+04	5.13274E+04	1.00000E+00
37	7	14	1.57080E+04	3.34071E+04	1.00000E+00
38	7	15	1.57080E+04	3.58407E+04	1.00000E+00
39	7	16	1.57080E+04	3.84956E+04	1.00000E+00
40	10	5	2.34513E+04	1.01770E+04	-4.00000E+00
41	6	17	1.30531E+04	4.09292E+04	1.00000E+00
42	6	18	1.30531E+04	4.35841E+04	1.00000E+00
43	10	4	2.34513E+04	7.74336E+03	-4.00000E+00
44	5	19	1.03982E+04	4.62389E+04	1.00000E+00
45	5	20	1.03982E+04	4.86726E+04	1.00000E+00
46	19	22	4.69027E+04	5.37611E+04	1.00000E+00
47	18	26	4.42478E+04	6.41593E+04	1.00000E+00
48	19	30	4.69027E+04	7.43363E+04	1.00000E+00
49	17	18	4.18142E+04	4.35841E+04	2.00000E+00
50	19	14	4.69027E+04	3.34071E+04	2.00000E+00
51	20	10	4.95575E+04	2.30088E+04	2.00000E+00
52	22	6	5.48673E+04	1.28319E+04	2.00000E+00

\*\*\*\*\* SURFACE WATER BODIES \*\*\*\*\*

Number of surface water body nodes : 0

\*\*\*\*\* AQUIFER PROPERTIES \*\*\*\*\*

Number of different material properties : 2

No.	Kxx [ft/d]	Kyy [ft/d]	Porosity [-]	
1	4.00000E+02	4.00000E+02	3.00000E-01	(default)
2	4.00000E+01	4.00000E+01	3.00000E-01	

## \*\*\*\*\* DISTRIBUTION OF AQUIFER MATERIAL PROPERTIES \*\*\*\*\*

[illegible]

	18	19	20	21	22	23	24
40	*	*	*	*	*	*	*
39	*	*	*	*	*	*	*
38	*	*	*	*	*	*	*
37	*	*	*	*	*	*	*
36	*	*	*	*	*	*	*
35	*	*	*	*	*	*	*
34	*	*	*	*	*	*	*
33	*	*	*	*	*	*	*
32	1	1	*	*	*	*	*
31	1	1	*	*	*	*	*
30	1	1	*	*	*	*	*
29	1	1	*	*	*	*	*
28	1	*	*	*	*	*	*
27	1	*	*	*	*	*	*
26	1	*	*	*	*	*	*
25	1	*	*	*	*	*	*
24	1	1	*	*	*	*	*



17	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1	1
16	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
15	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
14	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
13	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
12	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
11	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1
10	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1
9	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
8	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
7	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
6	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
5	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
4	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1
3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	1
2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

	18	19	20	21	22	23	24
40	*	*	*	*	*	*	*
39	*	*	*	*	*	*	*
38	*	*	*	*	*	*	*
37	*	*	*	*	*	*	*
36	*	*	*	*	*	*	*
35	*	*	*	*	*	*	*
34	*	*	*	*	*	*	*
33	*	*	*	*	*	*	*
32	1	1	*	*	*	*	*
31	1	1	*	*	*	*	*
30	1	1	*	*	*	*	*
29	1	1	*	*	*	*	*
28	1	*	*	*	*	*	*
27	1	*	*	*	*	*	*
26	1	*	*	*	*	*	*
25	1	*	*	*	*	*	*
24	1	1	*	*	*	*	*
23	1	1	*	*	*	*	*
22	1	1	*	*	*	*	*
21	1	*	*	*	*	*	*
20	*	*	*	*	*	*	*
19	*	*	*	*	*	*	*
18	*	*	*	*	*	*	*
17	1	*	*	*	*	*	*
16	1	*	*	*	*	*	*
15	1	1	*	*	*	*	*
14	1	1	*	*	*	*	*
13	1	1	*	*	*	*	*
12	1	1	1	*	*	*	*
11	1	1	1	*	*	*	*
10	1	1	1	*	*	*	*
9	1	1	1	1	*	*	*
8	1	1	1	1	1	*	*
7	1	1	1	1	1	*	*
6	1	1	1	1	1	*	*
5	1	1	1	1	*	*	*
4	1	1	1	*	*	*	*
3	1	*	*	*	*	*	*
2	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*

18 19 20 21 22 23 24

\*\*\*\*\* AREAL RECHARGE \*\*\*\*\*

Number of different infiltration/evapotranspiration rates : 0

No.	infiltration	evapotranspiration	effective recharge
	[L/T]	[L/T]	[L/T]

\*\*\*\*\* DISTRIBUTION OF AREAL IN/OUT-FLUXES \*\*\*\*\*

[illegible]

17	1	*	*	*	*	*	*
16	1	*	*	*	*	*	*
15	1	1	*	*	*	*	*
14	1	1	*	*	*	*	*
13	1	1	*	*	*	*	*
12	1	1	1	*	*	*	*
11	1	1	1	*	*	*	*
10	1	1	1	*	*	*	*
9	1	1	1	1	*	*	*
8	1	1	1	1	1	*	*
7	1	1	1	1	1	*	*
6	1	1	1	1	1	*	*
5	1	1	1	1	*	*	*
4	1	1	1	*	*	*	*
3	1	*	*	*	*	*	*
2	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*

---

	18	19	20	21	22	23	24
--	----	----	----	----	----	----	----

\*\*\*\*\* PATHLINE & PARTICLE TRACKING DATA \*\*\*\*\*

Number of forward particles : 11

No.	x-release	y-release
1	2.87611E+04	4.09292E+04
2	3.11947E+04	4.09292E+04
3	3.38496E+04	4.09292E+04
4	3.38496E+04	3.84956E+04
5	3.11947E+04	3.84956E+04
6	2.87611E+04	3.84956E+04
7	2.87611E+04	3.58407E+04
8	3.11947E+04	3.58407E+04
9	3.11947E+04	3.34071E+04
10	2.87611E+04	3.34071E+04
11	3.38496E+04	3.58407E+04

Number of reverse particles : 0

Particles released at wells :

Well-No.	Particles released
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0

\*\*\*\*\* HYDRAULIC HEAD DISTRIBUTION \*\*\*\*\*

	1	2	3	4	5	6
40	*	*	*	*	*	*
39	*	*	*	*	*	*
38	*	*	*	*	*	*
37	*	*	*	*	*	*
36	*	*	*	*	*	*
35	*	*	*	*	*	*

34	*	*	*	*	*	*
33	*	*	*	*	*	*
32	*	*	*	*	*	*
31	*	*	*	*	*	*
30	*	*	*	*	*	6.0062E+03
29	*	*	*	*	5.9974E+03	6.0012E+03
28	*	*	*	*	5.9939E+03	5.9959E+03
27	*	*	*	5.9857E+03	5.9883E+03	5.9900E+03
26	*	*	*	5.9833E+03	5.9836E+03	5.9840E+03
25	*	*	*	5.9806E+03	5.9787E+03	5.9778E+03
24	*	*	*	5.9756E+03	5.9728E+03	5.9713E+03
23	*	*	*	5.9714E+03	5.9679E+03	5.9653E+03
22	*	*	*	5.9734E+03	5.9648E+03	5.9606E+03
21	*	*	*	*	5.9619E+03	5.9522E+03
20	*	*	*	*	5.9575E+03	5.9442E+03
19	*	*	*	*	5.9575E+03	5.9399E+03
18	*	*	*	*	*	5.9359E+03
17	*	*	*	*	*	5.9344E+03
16	*	*	*	*	*	*
15	*	*	*	*	*	*
14	*	*	*	*	*	*
13	*	*	*	*	*	*
12	*	*	*	*	*	*
11	*	*	*	*	*	*
10	*	*	*	*	*	*
9	*	*	*	*	*	*
8	*	*	*	*	*	*
7	*	*	*	*	*	*
6	*	*	*	*	*	*
5	*	*	*	*	*	*
4	*	*	*	*	*	*
3	*	*	*	*	*	*
2	*	*	*	*	*	*
1	*	*	*	*	*	*

	1	2	3	4	5	6
	7	8	9	10	11	12
40	*	*	*	*	*	*
39	*	*	*	*	*	*
38	*	*	*	*	*	*
37	*	*	*	*	*	6.1300E+03
36	*	*	*	*	6.1300E+03	6.1203E+03
35	*	*	*	*	6.1053E+03	6.1038E+03
34	*	*	*	6.0696E+03	6.0819E+03	6.0864E+03
33	*	*	6.0483E+03	6.0577E+03	6.0661E+03	6.0714E+03
32	*	6.0316E+03	6.0393E+03	6.0468E+03	6.0534E+03	6.0583E+03
31	6.0176E+03	6.0241E+03	6.0305E+03	6.0366E+03	6.0422E+03	6.0468E+03
30	6.0114E+03	6.0167E+03	6.0219E+03	6.0271E+03	6.0319E+03	6.0362E+03
29	6.0051E+03	6.0092E+03	6.0135E+03	6.0179E+03	6.0221E+03	6.0262E+03
28	5.9986E+03	6.0017E+03	6.0051E+03	6.0087E+03	6.0126E+03	6.0166E+03
27	5.9918E+03	5.9938E+03	5.9963E+03	5.9993E+03	6.0028E+03	6.0070E+03
26	5.9846E+03	5.9856E+03	5.9871E+03	5.9893E+03	5.9926E+03	5.9970E+03
25	5.9772E+03	5.9769E+03	5.9772E+03	5.9784E+03	5.9812E+03	5.9862E+03
24	5.9694E+03	5.9676E+03	5.9663E+03	5.9660E+03	5.9676E+03	5.9737E+03
23	5.9615E+03	5.9579E+03	5.9546E+03	5.9516E+03	5.9498E+03	5.9577E+03
22	5.9532E+03	5.9480E+03	5.9427E+03	5.9359E+03	5.9446E+03	5.9551E+03
21	5.9426E+03	5.9382E+03	5.9323E+03	5.9271E+03	5.9377E+03	5.9486E+03
20	5.9347E+03	5.9297E+03	5.9212E+03	5.9249E+03	5.9305E+03	5.9363E+03
19	5.9301E+03	5.9245E+03	5.9204E+03	5.9207E+03	5.9231E+03	5.9263E+03
18	5.9245E+03	5.9178E+03	5.9155E+03	5.9146E+03	5.9149E+03	5.9166E+03
17	5.9152E+03	5.9123E+03	5.9090E+03	5.9072E+03	5.9055E+03	5.9060E+03
16	5.8926E+03	5.8960E+03	5.9013E+03	5.8996E+03	5.8941E+03	5.8943E+03
15	5.8582E+03	5.8606E+03	5.8728E+03	5.8782E+03	5.8772E+03	5.8806E+03
14	5.8131E+03	5.8157E+03	5.8275E+03	5.8459E+03	5.8570E+03	5.8617E+03
13	5.7572E+03	5.7617E+03	5.7759E+03	5.8121E+03	5.8342E+03	5.8395E+03
12	5.7240E+03	5.7270E+03	5.7359E+03	5.7743E+03	5.8101E+03	5.8183E+03
11	5.7150E+03	5.7150E+03	5.7304E+03	5.7560E+03	5.7845E+03	5.7992E+03
10	*	*	5.7150E+03	5.7500E+03	5.7723E+03	5.7862E+03
9	*	*	*	5.7562E+03	5.7682E+03	5.7784E+03
8	*	*	*	5.7577E+03	5.7656E+03	5.7733E+03
7	*	*	*	5.7574E+03	5.7634E+03	5.7695E+03
6	*	*	*	5.7563E+03	5.7612E+03	5.7663E+03
5	*	*	*	5.7545E+03	5.7589E+03	5.7635E+03
4	*	*	*	5.7520E+03	5.7564E+03	5.7608E+03

3	*	*	*	*	*	*
2	*	*	*	*	*	*
1	*	*	*	*	*	*
	7	8	9	10	11	12
	13	14	15	16	17	18
40	*	*	*	*	*	*
39	*	*	*	*	*	*
38	*	6.1300E+03	6.1300E+03	*	*	*
37	6.1300E+03	6.1257E+03	6.1263E+03	6.1300E+03	*	*
36	6.1175E+03	6.1166E+03	6.1195E+03	6.1300E+03	*	*
35	6.1034E+03	6.1037E+03	6.1053E+03	6.1080E+03	*	*
34	6.0885E+03	6.0897E+03	6.0901E+03	6.0887E+03	6.0807E+03	*
33	6.0745E+03	6.0762E+03	6.0768E+03	6.0758E+03	6.0729E+03	*
32	6.0618E+03	6.0640E+03	6.0650E+03	6.0646E+03	6.0624E+03	6.0574E+03
31	6.0503E+03	6.0529E+03	6.0545E+03	6.0551E+03	6.0546E+03	6.0535E+03
30	6.0398E+03	6.0428E+03	6.0450E+03	6.0465E+03	6.0475E+03	6.0485E+03
29	6.0300E+03	6.0334E+03	6.0362E+03	6.0385E+03	6.0405E+03	6.0428E+03
28	6.0206E+03	6.0244E+03	6.0278E+03	6.0307E+03	6.0331E+03	6.0350E+03
27	6.0114E+03	6.0159E+03	6.0200E+03	6.0235E+03	6.0263E+03	6.0282E+03
26	6.0022E+03	6.0077E+03	6.0127E+03	6.0169E+03	6.0202E+03	6.0223E+03
25	5.9929E+03	5.9998E+03	6.0061E+03	6.0114E+03	6.0153E+03	6.0177E+03
24	5.9834E+03	5.9926E+03	6.0006E+03	6.0071E+03	6.0117E+03	6.0146E+03
23	5.9744E+03	5.9867E+03	5.9966E+03	6.0045E+03	6.0099E+03	6.0132E+03
22	5.9695E+03	5.9829E+03	5.9946E+03	6.0042E+03	6.0102E+03	6.0134E+03
21	5.9657E+03	5.9809E+03	5.9946E+03	6.0073E+03	6.0133E+03	6.0151E+03
20	5.9543E+03	5.9777E+03	6.0006E+03	6.0168E+03	6.0204E+03	*
19	5.9427E+03	5.9722E+03	6.0052E+03	6.0258E+03	6.0293E+03	*
18	5.9312E+03	5.9634E+03	6.0054E+03	6.0350E+03	6.0398E+03	*
17	5.9142E+03	5.9450E+03	5.9941E+03	6.0447E+03	6.0534E+03	6.0512E+03
16	5.8964E+03	5.9253E+03	5.9652E+03	6.0199E+03	6.0424E+03	6.0457E+03
15	5.8893E+03	5.9110E+03	5.9456E+03	5.9913E+03	6.0149E+03	6.0235E+03
14	5.8697E+03	5.8843E+03	5.9153E+03	5.9508E+03	5.9807E+03	5.9911E+03
13	5.8438E+03	5.8417E+03	5.8788E+03	5.9109E+03	5.9375E+03	5.9562E+03
12	5.8242E+03	5.8270E+03	5.8465E+03	5.8761E+03	5.9020E+03	5.9232E+03
11	5.8075E+03	5.8117E+03	5.8198E+03	5.8451E+03	5.8709E+03	5.8939E+03
10	5.7947E+03	5.7991E+03	5.7993E+03	5.8138E+03	5.8424E+03	5.8676E+03
9	5.7858E+03	5.7906E+03	5.7932E+03	5.7953E+03	5.8171E+03	5.8447E+03
8	5.7796E+03	5.7843E+03	5.7876E+03	5.7901E+03	5.8036E+03	5.8264E+03
7	5.7749E+03	5.7793E+03	5.7826E+03	5.7851E+03	5.7918E+03	5.8094E+03
6	5.7711E+03	5.7752E+03	5.7786E+03	5.7811E+03	5.7825E+03	5.7914E+03
5	5.7679E+03	5.7720E+03	5.7755E+03	5.7783E+03	5.7806E+03	5.7831E+03
4	5.7651E+03	5.7692E+03	5.7730E+03	5.7761E+03	5.7784E+03	5.7808E+03
3	*	*	*	5.7744E+03	5.7763E+03	5.7777E+03
2	*	*	*	*	*	*
1	*	*	*	*	*	*
	13	14	15	16	17	18
	19	20	21	22	23	24
40	*	*	*	*	*	*
39	*	*	*	*	*	*
38	*	*	*	*	*	*
37	*	*	*	*	*	*
36	*	*	*	*	*	*
35	*	*	*	*	*	*
34	*	*	*	*	*	*
33	*	*	*	*	*	*
32	6.0563E+03	*	*	*	*	*
31	6.0536E+03	*	*	*	*	*
30	6.0501E+03	*	*	*	*	*
29	6.0474E+03	*	*	*	*	*
28	*	*	*	*	*	*
27	*	*	*	*	*	*
26	*	*	*	*	*	*
25	*	*	*	*	*	*
24	6.0156E+03	*	*	*	*	*
23	6.0149E+03	*	*	*	*	*
22	6.0150E+03	*	*	*	*	*
21	*	*	*	*	*	*
20	*	*	*	*	*	*
19	*	*	*	*	*	*
18	*	*	*	*	*	*

17	*	*	*	*	*	*
16	*	*	*	*	*	*
15	6.0308E+03	*	*	*	*	*
14	6.0040E+03	*	*	*	*	*
13	5.9728E+03	*	*	*	*	*
12	5.9408E+03	5.9531E+03	*	*	*	*
11	5.9138E+03	5.9310E+03	*	*	*	*
10	5.8894E+03	5.9087E+03	*	*	*	*
9	5.8675E+03	5.8881E+03	5.9069E+03	*	*	*
8	5.8478E+03	5.8692E+03	5.8910E+03	5.9133E+03	*	*
7	5.8279E+03	5.8500E+03	5.8748E+03	5.9008E+03	*	*
6	5.8047E+03	5.8282E+03	5.8573E+03	5.8967E+03	*	*
5	5.7865E+03	5.8011E+03	5.8297E+03	*	*	*
4	5.7838E+03	5.7851E+03	*	*	*	*
3	*	*	*	*	*	*
2	*	*	*	*	*	*
1	*	*	*	*	*	*

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	19	20	21	22	23	24
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\*\*\*\*\* End of logbook \*\*\*\*\*

APPENDIX C  
LISTING OF SOURCE CONCENTRATIONS

**SOURCE CONCENTRATIONS (mg/L) FOR THE OLD UNDERFLOW SOLIDS PONDS**

Year	Aluminum	Arsenic	Cadmium	Cadmium w/otavite	Chloride	Fluoride	Manganese	Molybdenum
1964	3.11	0.018	1.41	0.07	364	40	4.95	2.07
1984	1.971	0.014	1.053	0.052	230.708	17.000	3.544	1.612
1988	0.792	0.008	0.587	0.029	92.680	17.000	1.817	0.978
1992	0.318	0.005	0.327	0.016	37.231	17.000	0.932	0.593
1996	0.128	0.003	0.183	0.009	14.957	17.000	0.478	0.360
2000	0.051	0.002	0.102	0.005	6.008	17.000	0.245	0.218
2004	0.021	0.001	0.057	0.003	2.414	17.000	0.126	0.132
2008	0.008	0.001	0.032	0.002	0.970	17.000	0.064	0.080
2012	0.003	0.000	0.018	0.001	0.390	17.000	0.033	0.049
2016	0.001	0.000	0.010	0.000	0.156	17.000	0.017	0.030
2020	0.001	0.000	0.005	0.000	0.063	17.000	0.009	0.018
2024	0.000	0.000	0.003	0.000	0.025	17.000	0.004	0.011
2028	0.000	0.000	0.002	0.000	0.010	17.000	0.002	0.007
2032	0.000	0.000	0.001	0.000	0.004	17.000	0.001	0.004
2036	0.000	0.000	0.001	0.000	0.002	17.000	0.001	0.002
2040	0.000	0.000	0.000	0.000	0.001	17.000	0.000	0.001
2044	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.001
2048	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.001
2052	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2056	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2060	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2064	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2068	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2072	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2076	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2080	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000

**SOURCE CONCENTRATIONS (mg/L) FOR THE OLD UNDERFLOW SOLIDS PONDS**

<b>Year</b>	<b>Aluminum</b>	<b>Arsenic</b>	<b>Cadmium</b>	<b>Cadmium w/otavite</b>	<b>Chloride</b>	<b>Fluoride</b>	<b>Manganese</b>	<b>Molybdenum</b>
2084	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2088	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2092	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2096	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2100	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2104	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2108	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000
2112	0.000	0.000	0.000	0.000	0.000	17.000	0.000	0.000

**SOURCE CONCENTRATIONS (mg/L) FOR THE OLD UNDERFLOW SOLIDS PONDS**

Year	Nickel	Nitrate	Selenium	Sulfate	Vanadium	Zinc
1964	0.33	11.9	1.51	620	0.22	9.25
1984	0.284	9.084	1.176	445.733	0.200	7.204
1988	0.210	5.294	0.713	230.378	0.165	4.369
1992	0.156	3.085	0.433	119.071	0.136	2.650
1996	0.115	1.798	0.262	61.542	0.112	1.607
2000	0.086	1.048	0.159	31.808	0.093	0.975
2004	0.063	0.611	0.097	16.440	0.077	0.591
2008	0.047	0.356	0.059	8.497	0.063	0.359
2012	0.035	0.207	0.036	4.392	0.052	0.218
2016	0.026	0.121	0.022	2.270	0.043	0.132
2020	0.019	0.070	0.013	1.173	0.036	0.080
2024	0.014	0.041	0.008	0.606	0.029	0.049
2028	0.010	0.024	0.005	0.313	0.024	0.029
2032	0.008	0.014	0.003	0.162	0.020	0.018
2036	0.006	0.008	0.002	0.084	0.016	0.011
2040	0.004	0.005	0.001	0.043	0.014	0.007
2044	0.003	0.003	0.001	0.022	0.011	0.004
2048	0.002	0.002	0.000	0.012	0.009	0.002
2052	0.002	0.001	0.000	0.006	0.008	0.001
2056	0.001	0.001	0.000	0.003	0.006	0.001
2060	0.001	0.000	0.000	0.002	0.005	0.001
2064	0.001	0.000	0.000	0.001	0.004	0.000
2068	0.001	0.000	0.000	0.000	0.004	0.000
2072	0.000	0.000	0.000	0.000	0.003	0.000
2076	0.000	0.000	0.000	0.000	0.002	0.000
2080	0.000	0.000	0.000	0.000	0.002	0.000

**SOURCE CONCENTRATIONS (mg/L) FOR THE OLD UNDERFLOW SOLIDS PONDS**

<b>Year</b>	<b>Nickel</b>	<b>Nitrate</b>	<b>Selenium</b>	<b>Sulfate</b>	<b>Vanadium</b>	<b>Zinc</b>
2084	0.000	0.000	0.000	0.000	0.002	0.000
2088	0.000	0.000	0.000	0.000	0.001	0.000
2092	0.000	0.000	0.000	0.000	0.001	0.000
2096	0.000	0.000	0.000	0.000	0.001	0.000
2100	0.000	0.000	0.000	0.000	0.001	0.000
2104	0.000	0.000	0.000	0.000	0.001	0.000
2108	0.000	0.000	0.000	0.000	0.001	0.000
2112	0.000	0.000	0.000	0.000	0.000	0.000

**MONSANTO 913-1101.605**

APPENDIX D  
LISTING OF TRANSPORT MODEL INPUT

Files listed below are contained on diskette as named. (MONSANTO 913-1101.605)

ALUMINUM

file: al0.in

400. 0.3 0.0075  
230 3. 1.8 0.  
730. 0.00274 30  
0 0 300. 11  
1964. 3.11  
1984. 1.971  
1988. 0.792  
1992. 0.318  
1996. 0.128  
2000. 0.051  
2004. 0.021  
2008. 0.008  
2012. 0.003  
2016. 0.001  
2020. 0.001  
1  
al0.dat 5000. 0. 0.

file: al1.in

400. 0.3 0.0075  
312. 3. 1.8 0.  
730. 0.00274 30  
0 0 300. 11  
1964. 3.11  
1984. 1.971  
1988. 0.792  
1992. 0.318  
1996. 0.128  
2000. 0.051  
2004. 0.021  
2008. 0.008  
2012. 0.003  
2016. 0.001  
2020. 0.001  
1  
al1.dat 8500. 0. 0.

file: al2.in

400. 0.3 0.0075  
460. 3. 1.8 0.  
730. 0.00274 30  
0 0 300. 11  
1964. 3.11  
1984. 1.971  
1988. 0.792  
1992. 0.318  
1996. 0.128  
2000. 0.051  
2004. 0.021  
2008. 0.008  
2012. 0.003  
2016. 0.001  
2020. 0.001  
1  
al2.dat 18500. 0. 0.

ARSENIC

file: as0.in

400. 0.3 0.0075  
230 3. 1. 0.  
730. 0.00274 30  
0 0 300. 9  
1964. 0.018  
1984. 0.014  
1988. 0.008  
1992. 0.005

NITRATE

file: n0.in

400. 0.3 0.0075  
230 3. 1. 0.96  
730. 0.00274 50  
0 0 300. 21  
1964 11.9  
1984 9.084  
1988 5.294  
1992 3.085  
1996 1.798  
2000 1.048  
2004 0.611  
2008 0.356  
2012 0.207  
2016 0.121  
2020 0.070  
2024 0.041  
2028 0.024  
2032 0.014  
2036 0.008  
2040 0.005  
2044 0.003  
2048 0.002  
2052 0.001  
2056 0.001  
2060 0.000  
1  
n0.dat 5000. 0. 0.

file: n1.in

400. 0.3 0.0075  
312. 3. 1. 0.96  
730. 0.00274 50  
0 0 300. 21  
1964 11.9  
1984 9.084  
1988 5.294  
1992 3.085  
1996 1.798  
2000 1.048  
2004 0.611  
2008 0.356  
2012 0.207  
2016 0.121  
2020 0.070  
2024 0.041  
2028 0.024  
2032 0.014  
2036 0.008  
2040 0.005  
2044 0.003  
2048 0.002  
2052 0.001  
2056 0.001  
2060 0.000  
1  
n1.dat 8500. 0. 0.

file: n2.in

400. 0.3 0.0075  
460. 3. 1. 0.96  
730. 0.00274 50  
0 0 300. 21  
1964 11.9  
1984 9.084  
1988 5.294  
1992 3.085  
1996 1.798  
2000 1.048

1996. 0.003  
2000. 0.002  
2004 0.001  
2008 0.001  
2012 0.000  
1  
as0.dat 5000. 0. 0.

file: as1.in

400. 0.3 0.0075  
312 3. 1. 0.  
730. 0.00274 30  
0 0 300. 9  
1964. 0.018  
1984. 0.014  
1988. 0.008  
1992. 0.005  
1996. 0.003  
2000. 0.002  
2004 0.001  
2008 0.001  
2012 0.000  
1

as1.dat 8500. 0. 0.

file: as2.in

400. 0.3 0.0075  
460. 3. 1. 0.  
730. 0.00274 30  
0 0 300. 9  
1964. 0.018  
1984. 0.014  
1988. 0.008  
1992. 0.005  
1996. 0.003  
2000. 0.002  
2004 0.001  
2008 0.001  
2012 0.000  
1

as2.dat 18500. 0. 0.

CADMIUM

file: cd0.in

400. 0.3 0.0075  
230 3. 11. 0.  
730. 0.00274 60  
0. 0. 300. 16  
1964 1.41  
1984 1.053  
1988 0.587  
1992 0.327  
1996 0.183  
2000 0.102  
2004 0.057  
2008 0.032  
2012 0.018  
2016 0.010  
2020 0.005  
2024 0.003  
2028 0.002  
2032 0.001  
2036 0.001  
2040 0.000  
1

cd0.dat 5000. 0. 0.

file: cd1.in

400. 0.3 0.0075  
312. 3. 11 0.  
730. 0.00274 60

2004 0.611  
2008 0.356  
2012 0.207  
2016 0.121  
2020 0.070  
2024 0.041  
2028 0.024  
2032 0.014  
2036 0.008  
2040 0.005  
2044 0.003  
2048 0.002  
2052 0.001  
2056 0.001  
2060 0.000

1  
n2.dat 18500. 0. 0.

NICKEL

file: ni0.in

400. 0.3 0.0075  
230 3. 1.8 0.  
730. 0.00274 40  
0 0 300. 24

1964 0.33  
1984 0.284  
1988 0.210  
1992 0.156  
1996 0.115  
2000 0.086  
2004 0.063  
2008 0.047  
2012 0.035  
2016 0.026  
2020 0.019  
2024 0.014  
2028 0.010  
2032 0.008  
2036 0.006  
2040 0.004  
2044 0.003  
2048 0.002  
2052 0.002  
2056 0.001  
2060 0.001  
2064 0.001  
2068 0.001  
2072 0.000

1  
ni0.dat 5000. 0. 0.

file: ni1.in

400. 0.3 0.0075  
312. 3. 1.8 0.  
730. 0.00274 40  
0 0 300. 24

1964 0.33  
1984 0.284  
1988 0.210  
1992 0.156  
1996 0.115  
2000 0.086  
2004 0.063  
2008 0.047  
2012 0.035  
2016 0.026  
2020 0.019  
2024 0.014  
2028 0.010  
2032 0.008  
2036 0.006  
2040 0.004  
2044 0.003

0. 0. 300. 16  
 1964 1.41  
 1984 1.053  
 1988 0.587  
 1992 0.327  
 1996 0.183  
 2000 0.102  
 2004 0.057  
 2008 0.032  
 2012 0.018  
 2016 0.010  
 2020 0.005  
 2024 0.003  
 2028 0.002  
 2032 0.001  
 2036 0.001  
 2040 0.000

1

cd1.dat 8500. 0. 0.

file: cd2.in

400. 0.3 0.0075  
 460. 3. 11 0.  
 730. 0.00274 60  
 0. 0. 300. 16  
 1964 1.41  
 1984 1.053  
 1988 0.587  
 1992 0.327  
 1996 0.183  
 2000 0.102  
 2004 0.057  
 2008 0.032  
 2012 0.018  
 2016 0.010  
 2020 0.005  
 2024 0.003  
 2028 0.002  
 2032 0.001  
 2036 0.001  
 2040 0.000

1

cd2.dat 18500. 0. 0.

CHLORIDE

file: cl0.in

400. 0.3 0.0075  
 230 3. 1. 16.  
 730. 0.00274 30  
 0 0 300. 17

1964	364
1984	230.708
1988	92.680
1992	37.231
1996	14.957
2000	6.008
2004	2.414
2008	0.970
2012	0.390
2016	0.156
2020	0.063
2024	0.025
2028	0.010
2032	0.004
2036	0.002
2040	0.001
2044	0.000

1

cl0.dat 5000. 0. 0.

file: cl1.in

400. 0.3 0.0075

2048	0.002
2052	0.002
2056	0.001
2060	0.001
2064	0.001
2068	0.001
2072	0.000

1

ni1.dat 8500. 0. 0.

file: ni2.in

400. 0.3 0.0075  
 460. 3. 1.8 0.  
 730. 0.00274 40  
 0 0 300. 24

1964	0.33
1984	0.284
1988	0.210
1992	0.156
1996	0.115
2000	0.086
2004	0.063
2008	0.047
2012	0.035
2016	0.026
2020	0.019
2024	0.014
2028	0.010
2032	0.008
2036	0.006
2040	0.004
2044	0.003
2048	0.002
2052	0.002
2056	0.001
2060	0.001
2064	0.001
2068	0.001
2072	0.000

1

ni2.dat 18500. 0. 0.

SELENIUM

file: se0.in

400. 0.3 0.0075  
 230 3. 1. 0.  
 730. 0.00274 50  
 0 0 300. 18

1964	1.51
1984	1.176
1988	0.713
1992	0.433
1996	0.262
2000	0.159
2004	0.097
2008	0.059
2012	0.036
2016	0.022
2020	0.013
2024	0.008
2028	0.005
2032	0.003
2036	0.002
2040	0.001
2044	0.001
2048	0.000

1

se0.dat 5000. 0. 0.

file: se1.in

400. 0.3 0.0075  
 312. 3. 1. 0.

312 3. 1. 16.  
 730. 0.00274 30  
 0 0 300. 17

1964	364
1984	230.708
1988	92.680
1992	37.231
1996	14.957
2000	6.008
2004	2.414
2008	0.970
2012	0.390
2016	0.156
2020	0.063
2024	0.025
2028	0.010
2032	0.004
2036	0.002
2040	0.001
2044	0.000

1  
 cl1.dat 8500. 0. 0.

file: cl2.in

400. 0.3 0.0075  
 460. 3. 1. 16.  
 730. 0.00274 30  
 0 0 300. 17

1964	364
1984	230.708
1988	92.680
1992	37.231
1996	14.957
2000	6.008
2004	2.414
2008	0.970
2012	0.390
2016	0.156
2020	0.063
2024	0.025
2028	0.010
2032	0.004
2036	0.002
2040	0.001
2044	0.000

1  
 cl2.dat 18500. 0. 0.

FLUORIDE

file: fl0.in

400. 0.3 0.0075  
 230 3. 1. 0.  
 730. 0.00274 30  
 0 0 300. 2  
 1964. 40.  
 1984. 17.  
 1

fl0.dat 5000. 0. 0.

file: fl1.in

400. 0.3 0.0075  
 312. 3. 1. 0.  
 730. 0.00274 30  
 0 0 300. 2  
 1964. 40.  
 1984. 17.  
 1

fl1.dat 8500. 0. 0.

file: fl2.in

400. 0.3 0.0075

730. 0.00274 50  
 0 0 300. 18

1964	1.51
1984	1.176
1988	0.713
1992	0.433
1996	0.262
2000	0.159
2004	0.097
2008	0.059
2012	0.036
2016	0.022
2020	0.013
2024	0.008
2028	0.005
2032	0.003
2036	0.002
2040	0.001
2044	0.001
2048	0.000

1  
 se1.dat 8500. 0. 0.

file: se2.in

400. 0.3 0.0075  
 460. 3. 1. 0.  
 730. 0.00274 50  
 0 0 300. 18

1964	1.51
1984	1.176
1988	0.713
1992	0.433
1996	0.262
2000	0.159
2004	0.097
2008	0.059
2012	0.036
2016	0.022
2020	0.013
2024	0.008
2028	0.005
2032	0.003
2036	0.002
2040	0.001
2044	0.001
2048	0.000

1  
 se2.dat 18500. 0. 0.

SULFATE

file: s0.in

400. 0.3 0.0075  
 230 3. 1. 74.  
 730. 0.00274 50  
 0 0 300. 23

1964	620
1984	445.733
1988	230.378
1992	119.071
1996	61.542
2000	31.808
2004	16.440
2008	8.497
2012	4.392
2016	2.270
2020	1.173
2024	0.606
2028	0.313
2032	0.162
2036	0.084
2040	0.043
2044	0.022
2048	0.012

460. 3. 1. 0.  
730. 0.00274 30  
0 0 300. 2  
1964. 40.  
1984. 17.

1  
fl2.dat 18500. 0. 0.

MANGANESE

file: mn0.in

400. 0.3 0.0075  
230 3. 2.6 0.  
730. 0.00274 40  
0 0 300. 16

1964	4.95
1984	3.544
1988	1.817
1992	0.932
1996	0.478
2000	0.245
2004	0.126
2008	0.064
2012	0.033
2016	0.017
2020	0.009
2024	0.004
2028	0.002
2032	0.001
2036	0.001
2040	0.000

1  
mn0.dat 5000. 0. 0.

file: mn1.in

400. 0.3 0.0075  
312. 3. 2.6 0.  
730. 0.00274 40  
0 0 300. 16

1964	4.95
1984	3.544
1988	1.817
1992	0.932
1996	0.478
2000	0.245
2004	0.126
2008	0.064
2012	0.033
2016	0.017
2020	0.009
2024	0.004
2028	0.002
2032	0.001
2036	0.001
2040	0.000

1  
mn1.dat 8500. 0. 0.

file: mn2.in

400. 0.3 0.0075  
460. 3. 2.6 0.  
730. 0.00274 40  
0 0 300. 16

1964	4.95
1984	3.544
1988	1.817
1992	0.932
1996	0.478
2000	0.245
2004	0.126
2008	0.064
2012	0.033
2016	0.017

2052	0.006
2056	0.003
2060	0.002
2064	0.001
2068	0.000

1  
s0.dat 5000. 0. 0.

file: s1.in

400. 0.3 0.0075  
312. 3. 1. 74.  
730. 0.00274 50  
0 0 300. 23

1964	620
1984	445.733
1988	230.378
1992	119.071
1996	61.542
2000	31.808
2004	16.440
2008	8.497
2012	4.392
2016	2.270
2020	1.173
2024	0.606
2028	0.313
2032	0.162
2036	0.084
2040	0.043
2044	0.022
2048	0.012
2052	0.006
2056	0.003
2060	0.002
2064	0.001
2068	0.000

1  
s1.dat 8500. 0. 0.

file: s2.in

400. 0.3 0.0075  
460. 3. 1. 74.  
730. 0.00274 50  
0 0 300. 23

1964	620
1984	445.733
1988	230.378
1992	119.071
1996	61.542
2000	31.808
2004	16.440
2008	8.497
2012	4.392
2016	2.270
2020	1.173
2024	0.606
2028	0.313
2032	0.162
2036	0.084
2040	0.043
2044	0.022
2048	0.012
2052	0.006
2056	0.003
2060	0.002
2064	0.001
2068	0.000

1  
s2.dat 18500. 0. 0.

VANADIUM

file: v0.in

2020 0.009  
 2024 0.004  
 2028 0.002  
 2032 0.001  
 2036 0.001  
 2040 0.000

1  
 mn2.dat 18500. 0. 0.

MOLYBDENUM

file: mo0.in

400. 0.3 0.0075  
 230 3. 4.2 0.  
 730. 0.00274 40  
 0 0 300. 19

1964 2.07  
 1984 1.612  
 1988 0.978  
 1992 0.593  
 1996 0.360  
 2000 0.218  
 2004 0.132  
 2008 0.080  
 2012 0.049  
 2016 0.030  
 2020 0.018  
 2024 0.011  
 2028 0.007  
 2032 0.004  
 2036 0.002  
 2040 0.001  
 2044 0.001  
 2048 0.001  
 2052 0.000

1  
 mo0.dat 5000. 0. 0.

file: mo1.in

400. 0.3 0.0075  
 312. 3. 4.2 0.  
 730. 0.00274 40  
 0 0 300. 19

1964 2.07  
 1984 1.612  
 1988 0.978  
 1992 0.593  
 1996 0.360  
 2000 0.218  
 2004 0.132  
 2008 0.080  
 2012 0.049  
 2016 0.030  
 2020 0.018  
 2024 0.011  
 2028 0.007  
 2032 0.004  
 2036 0.002  
 2040 0.001  
 2044 0.001  
 2048 0.001  
 2052 0.000

1  
 mo1.dat 8500. 0. 0.

file: mo2.in

400. 0.3 0.0075  
 460. 3. 4.2 0.  
 730. 0.00274 40  
 0 0 300. 19

1964 2.07  
 1984 1.612  
 1988 0.978

400. 0.3 0.0075  
 230 3. 1.8 0.  
 730. 0.00274 60  
 0 0 300. 34

1964 0.22  
 1984 0.200  
 1988 0.165  
 1992 0.136  
 1996 0.112  
 2000 0.093  
 2004 0.077  
 2008 0.063  
 2012 0.052  
 2016 0.043  
 2020 0.036  
 2024 0.029  
 2028 0.024  
 2032 0.020  
 2036 0.016  
 2040 0.014  
 2044 0.011  
 2048 0.009  
 2052 0.008  
 2056 0.006  
 2060 0.005  
 2064 0.004  
 2068 0.004  
 2072 0.003  
 2076 0.002  
 2080 0.002  
 2084 0.002  
 2088 0.001  
 2092 0.001  
 2096 0.001  
 2100 0.001  
 2104 0.001  
 2108 0.001  
 2112 0.000

1  
 v0.dat 5000. 0. 0.

file: v1.in

400. 0.3 0.0075  
 312. 3. 1.8 0.  
 730. 0.00274 60  
 0 0 300. 34

1964 0.22  
 1984 0.200  
 1988 0.165  
 1992 0.136  
 1996 0.112  
 2000 0.093  
 2004 0.077  
 2008 0.063  
 2012 0.052  
 2016 0.043  
 2020 0.036  
 2024 0.029  
 2028 0.024  
 2032 0.020  
 2036 0.016  
 2040 0.014  
 2044 0.011  
 2048 0.009  
 2052 0.008  
 2056 0.006  
 2060 0.005  
 2064 0.004  
 2068 0.004  
 2072 0.003  
 2076 0.002  
 2080 0.002  
 2084 0.002  
 2088 0.001  
 2092 0.001

1992	0.593
1996	0.360
2000	0.218
2004	0.132
2008	0.080
2012	0.049
2016	0.030
2020	0.018
2024	0.011
2028	0.007
2032	0.004
2036	0.002
2040	0.001
2044	0.001
2048	0.001
2052	0.000

1  
mo2.dat 18500. 0. 0.

2096	0.001
2100	0.001
2104	0.001
2108	0.001
2112	0.000

1  
v1.dat 8500. 0. 0.

file: v2.in

400. 0.3 0.0075  
460. 3. 1.8 0.  
730. 0.00274 60  
0 0 300. 34

1964	0.22
1984	0.200
1988	0.165
1992	0.136
1996	0.112
2000	0.093
2004	0.077
2008	0.063
2012	0.052
2016	0.043
2020	0.036
2024	0.029
2028	0.024
2032	0.020
2036	0.016
2040	0.014
2044	0.011
2048	0.009
2052	0.008
2056	0.006
2060	0.005
2064	0.004
2068	0.004
2072	0.003
2076	0.002
2080	0.002
2084	0.002
2088	0.001
2092	0.001
2096	0.001
2100	0.001
2104	0.001
2108	0.001
2112	0.000

1  
v2.dat 18500. 0. 0.

ZINC

file: zn0.in

400. 0.3 0.0075  
230 3. 1.8 0.  
730. 0.00274 50  
0 0 300. 22

1964	9.25
1984	7.204
1988	4.369
1992	2.650
1996	1.607
2000	0.975
2004	0.591
2008	0.359
2012	0.218
2016	0.132
2020	0.080
2024	0.049
2028	0.029
2032	0.018
2036	0.011
2040	0.007
2044	0.004

2048	0.002
2052	0.001
2056	0.001
2060	0.001
2064	0.000

1  
zn0.dat 5000. 0. 0.

file: zn1.in

400. 0.3 0.0075  
312. 3. 1.8 0.  
730. 0.00274 50  
0 0 300. 22

1964	9.25
1984	7.204
1988	4.369
1992	2.650
1996	1.607
2000	0.975
2004	0.591
2008	0.359
2012	0.218
2016	0.132
2020	0.080
2024	0.049
2028	0.029
2032	0.018
2036	0.011
2040	0.007
2044	0.004
2048	0.002
2052	0.001
2056	0.001
2060	0.001
2064	0.000

1  
zn1.dat 8500. 0. 0.

file: zn2.in

400. 0.3 0.0075  
460. 3. 1.8 0.  
730. 0.00274 50  
0 0 300. 22

1964	9.25
1984	7.204
1988	4.369
1992	2.650
1996	1.607
2000	0.975
2004	0.591
2008	0.359
2012	0.218
2016	0.132
2020	0.080
2024	0.049
2028	0.029
2032	0.018
2036	0.011
2040	0.007
2044	0.004
2048	0.002
2052	0.001
2056	0.001
2060	0.001
2064	0.000

1  
zn2.dat 18500. 0. 0.

**APPENDIX L-3**  
**MEMORANDUM ON GROUNDWATER QUALITY**

**Golder Associates Inc.**

4104-148th Avenue, NE  
Redmond, WA 98052  
Telephone (206) 883-0777  
Fax (206) 882-5498



**PHASE II REMEDIAL INVESTIGATION  
MEMORANDUM ON GROUNDWATER QUALITY**

**MONSANTO ELEMENTAL  
PHOSPHOROUS PLANT  
SODA SPRINGS, IDAHO**

**Prepared for:**

**Monsanto Company**

**Prepared by:**

**Golder Associates Inc.  
Redmond, Washington**

**October 29, 1993**

**913-1101.608**

**TABLE OF CONTENTS**

	<b><u>Page No.</u></b>
1. INTRODUCTION	1
2. BACKGROUND INFORMATION	2
2.1 Description of Source Areas	2
2.2 Groundwater Sampling and Analysis	2
2.3 Constituents of Potential Interest	3
2.4 Summary of Hydrogeology	4
3. CURRENT EXTENT OF CONSTITUENTS IN GROUNDWATER	5
3.1 Upper Basalt Zone	5
3.2 Lower Basalt Zone	7
4. TEMPORAL TRENDS OF CONSTITUENTS IN GROUNDWATER	9
5. PRODUCTION WELL AREA	11
6. CONCLUSIONS	12
7. REFERENCES	13

**LIST OF TABLES**

1. Sample Analysis for May 1993 Groundwater and Spring Samples
2. Groundwater Quality Statistics for the Upper Basalt Zone During May 1993
3. Groundwater Quality Statistics for the Lower Basalt Zone During May 1993
4. Regression Analyses for Cadmium at Selected Test Wells
5. Regression Analyses for Chloride at Selected Test Wells

**LIST OF FIGURES**

1. Location Map
2. Source Location Map
3. Location of Wells and Springs in the Upper Basalt Zone
4. Location of Wells in the Lower Basalt Zone
5. Potentiometric Surface for the Upper Basalt Zone
6. Potentiometric Surface for the Lower Basalt Zone
7. Aluminum Groundwater Concentrations in the Upper Basalt Zone During May 1993

TABLE OF CONTENTS (Cont.)LIST OF FIGURES (Cont.)

8. Arsenic Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
9. Cadmium Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
10. Chloride Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
11. Fluoride Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
12. Iron Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
13. Manganese Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
14. Molybdenum Groundwater Concentrations in the Upper Basalt  
Zone During May 1993
15. Nickel Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
16. Nitrate Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
17. Selenium Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
18. Sulfate Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
19. Vanadium Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
20. Zinc Groundwater Concentrations in the Upper Basalt Zone  
During May 1993
21. Aluminum Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
22. Arsenic Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
23. Cadmium Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
24. Chloride Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
25. Fluoride Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
26. Iron Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
27. Manganese Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
28. Molybdenum Groundwater Concentrations in the Lower Basalt Zone  
During May 1993

**TABLE OF CONTENTS (Cont.)****LIST OF FIGURES (Cont.)**

- 29. Nickel Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 30. Nitrate Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 31. Selenium Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 32. Sulfate Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 33. Vanadium Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 34. Zinc Groundwater Concentrations in the Lower Basalt Zone  
During May 1993
- 35. Cadmium Groundwater Concentration Old Underflow Solids Ponds Area
- 36. Cadmium Groundwater Concentration Northwest Pond/Hydroclarifier Area
- 37. Chloride Groundwater Concentration Old Underflow Solids Ponds Area
- 38. Chloride Groundwater Concentration Northwest Pond/Hydroclarifier Area

**LIST OF APPENDICES**

Appendix A Time History Plots of Groundwater Concentration

## 1. INTRODUCTION

This memorandum addresses one component of an ongoing remedial investigation (RI) and feasibility study (FS) related to the Monsanto Company elemental phosphorous plant in Soda Springs, Idaho (Figure 1). Information presented in this memorandum characterizes groundwater quality in relation to activities at the Monsanto plant and is based on data collected through May, 1993. Information presented in this memorandum will be integrated into the Phase II RI report. This report will in turn be presented to the United States Environmental Protection Agency (EPA) at a later date.

Documentation of earlier investigations for the elemental phosphorous plant exists in several reports. The Preliminary Site Characterization Summary Report (PSCSR), consisting of a summary of Phase I RI activities, was submitted to EPA for review in April, 1992 (Golder, 1992a). The Remedial Alternatives Development and Preliminary Screening of Candidate Technologies Memorandum (RAD/PSCTM), consisting of a summary of the Phase I FS, was submitted to EPA in June, 1992 (Golder, 1992b). A Phase II RI work plan (Golder, 1992c) was subsequently developed based on the PSCSR, and the data needs identified in the RAD/PSCTM. The Phase II RI scope of work, detailed in the work plan was approved by EPA in January, 1993.

Following approval of the Phase II RI work plan, field investigations and technical analyses were completed and subsequently documented in several memorandums. These memorandums present results of a geophysical survey (Golder, 1992d), of analyses of geochemistry and hydrology of source areas and the vadose zone (Golder, 1993a), of hydrogeological investigations (Golder, 1993b), of surficial soil and stream sediment investigations (Golder, 1993c), and of groundwater flow and solute transport modeling (Golder, 1993d).

## 2. BACKGROUND INFORMATION

### 2.1 Description of Source Areas

Eight source areas shown on Figure 2 are under investigation for their potential to release constituents to groundwater. Earlier work (Golder, 1993a) presents specific details about each of these source areas including calculations of the present day recharge to groundwater occurring through the source areas.

Of the eight sources, the northwest pond, the hydroclarifier, and the old underflow solids ponds were found to be areas where at one time constituents were released to groundwater. Upon Monsanto's awareness of these conditions, plant practices were changed and the source areas were remediated. In 1988 soils were excavated from the northwest pond and a bentonite liner was installed. The hydroclarifier, which at one time leaked water to the subsurface, was completely replaced in 1985 with a modern facility including leak detection equipment. Leakage has not been observed from the new hydroclarifier. The old underflow solids ponds, used to dewater a slurry of underflow solids, were taken out of use in 1983 and capped with molten slag and bentonite in 1988.

The southwest corner of the Monsanto plant also appears to be an area where releases to groundwater have occurred and may be occurring at present. This area contains three active ponds; two sewage evaporation ponds and a settling pond for non-contact cooling water. The sewage ponds intentionally drain to the subsurface and the settling pond discharges to Soda Creek via the effluent ditch and pipeline. The sewage ponds are in the process of being taken out of use, as the Plant connects to the City of Soda Springs collection system. There is also a closed dewatering pond in the southwest part of the Monsanto plant. This pond at one time was used to dewater a coke and quartzite dust slurry. It was replaced by a filter press in 1987 and now is partially filled by slag and partially filled by soil.

The underflow solids piles located in the northern part of the Monsanto plant do not appear to be sources of constituents to groundwater. Little if any natural recharge is able to pass through the piles which are recycled back into the phosphorous refining process. Thus, no mechanism exists to transport constituents from the piles to groundwater.

### 2.2 Groundwater Sampling and Analysis

A large list of groundwater sampling locations and constituents is evaluated each spring and fall in regard to the Monsanto RI/FS. Sampling locations include over 50 monitoring wells, about 15 springs, 4 production wells, and a limited number of other private wells. Several of the sampling locations are within the Kerr-McGee plant and are sampled and analyzed by Kerr-McGee (Figure 1). The sampling locations are shown on Figures 2 and 3.

The constituents of interest at the Monsanto plant include general water quality parameters, metals, and a few radiological parameters. Table 1 contains a list of the analytes evaluated in samples collected in May, 1993. The list of analytes was developed iteratively based on earlier sampling and analysis. Several analytes were deleted from this list and a few were added based on further sampling and analysis completed for the Phase I RI report.

### 2.3 Constituents of Potential Interest

Of those analytes evaluated in groundwater samples, certain analytes were found to be of greater interest than others. These analytes were identified based on their groundwater concentrations relative to maximum background concentrations, conservative human health risk concentrations, and conservative ecological risk concentrations.

Lists of constituents of potential interest were independently developed from the Phase I RI groundwater quality data by Golder (1992a) and EPA (Letter from J. C. Eldridge (SAIC) to T. Brincefield (EPA) dated September 3, 1992). The lists differ slightly due to differences in the screening methods. A new list will be developed in the Phase II RI report based on the additional data that has been collected.

The list of constituents identified by EPA is given below:

- Aluminum (Al),
- Arsenic (As),
- Cadmium (Cd),
- Chloride (Cl),
- Fluoride (F),
- Iron (Fe),
- Manganese (Mn),
- Molybdenum (Mo),
- Nickel (Ni),
- Nitrate (NO<sub>3</sub>),
- Radon-222 (Rn-222),
- Selenium (Se),
- Sulfate (SO<sub>4</sub>),
- Vanadium (V), and
- Zinc (Zn).

Each constituent of this list was analyzed in samples collected during May, 1993 with the exception of radon-222. Radon is no longer a constituent of potential interest due to the naturally high background concentrations and has been eliminated from the sampling.

## 2.4 Summary of Hydrogeology

The site hydrogeology forms a framework for the interpretation of groundwater quality data. The hydrogeology of the Monsanto plant and the general area within which it is located has been well studied as part of the RI process and earlier voluntary work pursued by the Monsanto Company.

The hydrogeologic characterization presented by Golder (1992a) defined two aquifers within basalt interbeds of the Blackfoot Lava Field. One of the aquifers is shallow and referred to as the Upper Basalt Zone (UBZ). The other aquifer is deeper and referred to as the Lower Basalt Zone (LBZ). The UBZ is the primary groundwater zone in the Blackfoot Lava Field, as it has much greater permeability than the LBZ and appears to conduct more water through the flow system. The UBZ and LBZ are weakly connected in the area of the Monsanto plant. Low permeability fault planes cut the UBZ and LBZ, creating groundwater regions that are separate from one another. Two of these faults, shown on Figures 2 and 3 on the west side of the Monsanto plant, play an important role in isolating groundwater regions.

Groundwater recharge to the UBZ and LBZ comes from the valley sides and from Blackfoot Reservoir to the north. Groundwater flow occurs from north to south in the Blackfoot Lava Field. Discharge occurs into Bear River and Alexander Reservoir to the south of Soda Springs. Springs located in the Blackfoot Lava Field are locations of both discharge and recharge. Deep conduit springs (e.g., Formation Spring) bring water from depth to the surface that subsequently infiltrates the shallow groundwater system providing recharge. Other springs are locations where the shallow groundwater system discharges to surface water bodies (e.g., Mormon Springs).

The influence of pumping wells and faults alters the general direction of groundwater flow in the vicinity of the Monsanto plant. Figures 5 and 6 show the groundwater elevation and flow directions at the Monsanto plant for the UBZ and LBZ, respectively. As shown on the figures, the faults in the west part of the Monsanto plant prevent the westerly flow of groundwater from the central plant area. They also direct groundwater in the vicinity of the old underflow solids ponds toward the southeast. The pumping wells, located in the north and central areas of the Plant, create drawdown causing radial flow to the wells. Groundwater flow occurring below the northwest pond and the hydroclarifier appears to be completely withdrawn from the aquifer by the pumping wells.

### 3. CURRENT EXTENT OF CONSTITUENTS IN GROUNDWATER

The most recent groundwater samples were collected in May 1993 and were analyzed for the constituents listed in Table 1. Data are posted and contoured on Figures 7 through 34 for the constituents of potential interest (Section 2.3). Figures 7 through 20 present results for the Upper Basalt Zone, or UBZ, whereas Figures 21 through 34 present results for the Lower Basalt Zone, or LBZ. Contours showing lines of equal concentration, or isopleths, were added to the figures manually. The contours were located by linear-, log-linear-, or visual-estimation based on data points on either side of the contour line. The analytical data are also statistically summarized in Tables 2 and 3 for the UBZ and LBZ, respectively.

#### 3.1 Upper Basalt Zone

Three or possibly four plumes have been identified in the Upper Basalt Zone below the Monsanto plant. Three of the plumes correspond to the historic source areas referred to as the old underflow solids ponds, the northwest pond, and the hydroclarifier. The fourth plume occurs in the southwest corner of the Plant and may be attributed to either a combination of the sewage evaporation ponds, the non-contact cooling water settling pond, and the coke and quartzite dust slurry pond, or the old underflow solids ponds. The Kerr-McGee Plant to the east of the Monsanto plant also is shown to produce groundwater plumes which have migrated to below the Monsanto plant. These plumes are not discussed further. A brief discussion for each constituent of potential interest in the UBZ is provided below.

**Aluminum** Aluminum was generally undetected or observed at low concentrations throughout the Plant. No plumes of aluminum are discernable in the data (Figure 7).

**Arsenic** Arsenic also was predominantly undetected in groundwater samples for the Monsanto plant. Arsenic was detected in the vicinity of the northwest pond and old underflow solids ponds areas (Figure 8).

**Cadmium** Cadmium was observed to occur in plumes near to the northwest pond, the hydroclarifier, and the old underflow solids ponds. In many samples cadmium was also undetected. Cadmium appears to be limited to the below the Plant, with no observed cadmium concentrations occurring in samples from south of the Plant (Figure 9).

**Chloride** Chloride forms relatively large plumes in the three main areas of the Plant in comparison to the metal constituents. The northwest pond plume and the hydroclarifier plume have coalesced and are withdrawn from the aquifer by the production wells in the center of the Plant. The plume from below the old underflow solids ponds has apparently migrated off-site to the south and has coalesced with the plume in the southwest corner (Figure 10). Part of this plume discharges at Calf and Mormon Springs.

**Fluoride** Fluoride also forms relatively large plumes in comparison to the metal constituents. The patterns of the fluoride plumes are similar to those of chloride, although the extent of fluoride is more limited (Figure 11).

**Iron** There appears to be limited areas of elevated iron concentrations below the Monsanto plant (Figure 12). The maximum iron concentration of 7.65 mg/L occurs at the Doc Kackley Spring and is considered to be a natural iron concentration. The iron concentration in Test Well 57, which is a control location for the Upper Basalt Zone, also is high with a value of 0.165 mg/L. The definitions of iron groundwater plumes below the Monsanto plant are generally poor.

**Manganese** Manganese concentrations indicate the presence of three plumes corresponding to the northwest pond, the hydroclarifier, and the old underflow solids ponds (Figure 13). The highest concentrations are typically less than 1 mg/L. Natural levels of manganese observed in Doc Kackley and Hooper Springs are between 0.3 and 0.4 mg/L, which are values similar to the plume areas.

**Molybdenum** Concentrations in groundwater for molybdenum also indicate the presence of three plumes of low concentration occurring the areas of the northwest pond, the hydroclarifier, and the old underflow solids ponds (Figure 14). The highest concentrations for molybdenum below the Monsanto plant occur along the east boundary. Elsewhere molybdenum concentrations are less than 0.6 mg/L.

**Nickel** Nickel has limited extent below the Plant, although it appears two minor plumes may exist (Figure 15). Nickel was undetected in 44 of 53 samples and the maximum concentration was 0.112 mg/L. Nickel is undetected in samples collected outside the Plant fence-line.

**Nitrate** Nitrate concentrations indicate the occurrence of three to four plumes (Figure 16). The highest concentrations on-site are about 15 mg/L and occur in the area of the hydroclarifier. Nitrate also appears to occur at abnormally high concentrations in control samples located along the north fence-line (e.g. 5.08 mg/L at TW-29), suggesting agricultural impacts to groundwater north of the Plant.

**Selenium** Selenium concentrations in groundwater indicate the presence of three to four plumes below the Monsanto plant in the locations of the northwest pond, the hydroclarifier, the old underflow solids ponds, and the southwest corner (Figure 17). The concentrations range up to 0.7 mg/L.

**Sulfate** The distribution of sulfate concentrations shows the occurrence of two plumes below the Monsanto plant (Figure 18). One plume lies below the area of the northwest pond and the hydroclarifier. The other plume occurs in the area of the old underflow solids ponds and the southwest corner of the Plant.

**Vanadium** Vanadium concentrations indicate the occurrence of two minor plumes below the Monsanto plant with the exception of the eastern fence-line area which overlies a larger vanadium plume (Figure 19). Vanadium was below detection in many samples

from the main Plant area and the highest concentrations occur along the eastern fence-line.

**Zinc** Groundwater concentrations of zinc are limited to the three primary plume areas, the northwest pond, the hydroclarifier, and the old underflow solids ponds (Figure 20). The concentrations average less than 0.5 mg/L and in 25 of 53 samples zinc was not detected.

### 3.2 Lower Basalt Zone

The LBZ is separated from the UBZ by an intervening aquitard of dense basalt. The aquitard reduces, or eliminates entirely, the mixing of groundwater from the two zones and consequently, few constituents are observed in groundwater from the LBZ in comparison to the UBZ. The extent of the aquitard below the Monsanto plant appears continuous based on borehole logs.

Some communication between the UBZ and LBZ does exist, however, and in the past, single well completions into both the UBZ and LBZ connected the zones. These well completions existed for a relatively short period, being installed in the early 1980s and then abandoned in the late 1980s.

**Aluminum** Aluminum was detected in only one groundwater sample collected from TW-44 (Figure 21). The concentration of 0.126 B mg/L measured in the hydroclarifier area is a minor indication of aluminum transport to the LBZ from the UBZ.

**Arsenic** Arsenic concentrations were below detection limits or very low throughout the LBZ (Figure 22).

**Cadmium** Cadmium was observed in several samples collected from the LBZ, indicating transport of cadmium from the UBZ to the LBZ below the Monsanto plant. The concentrations are less than 0.05 mg/L.

**Chloride** Chloride concentrations in the LBZ below the Monsanto plant range from 13 mg/L to 217 mg/L (Figure 24). The highest concentrations are related to the chloride plume east of the Monsanto plant.

**Fluoride** Low concentrations of fluoride were measured in LBZ samples (Figure 25), indicating minor transport of fluoride from the UBZ to the LBZ has occurred.

**Iron** Iron concentrations in the LBZ are naturally high with a few concentrations exceeding 10 mg/L (Figure 26). Much lower iron concentrations are observed in the UBZ indicating transport from the UBZ to the LBZ is limited. The high iron concentrations indicate the LBZ groundwater is recharged in part by the same groundwater discharging springs located to the west which discharge into Soda Creek.

**Manganese** Manganese concentrations in the LBZ are less than 0.7 mg/L (Figure 27). A low concentration manganese plume may be present in the LBZ in the area of the old underflow solids ponds.

**Molybdenum** With the exception of the area of the hydroclarifier, molybdenum was not detected in groundwater samples from the LBZ below the Monsanto plant (Figure 28).

**Nickel** Nickel was mostly undetected in the LBZ (Figure 29). One detection occurred below the old underflow solids ponds where a value of 0.036 B mg/L was observed.

**Nitrate** Nitrate was undetected in the LBZ below the Monsanto plant with the exception of samples collected from the eastern part of the Plant (Figure 30). Nitrate concentrations along the eastern border of the Plant appear to have resulted from the plume in this area.

**Selenium** Selenium was not detected in groundwater samples from the LBZ below the Monsanto plant (Figure 31).

**Sulfate** Sulfate concentrations appear slightly elevated in the LBZ in the area below the old underflow solids ponds (Figure 32). The maximum sulfate concentration occurs in the southeast corner of the Monsanto plant and is related to a plume to the east of the Plant.

**Vanadium** Vanadium was generally undetected in the LBZ below the Monsanto plant (Figure 33).

**Zinc** Concentrations of zinc are generally less than 0.1 mg/L, although, a concentration of 0.208 mg/L was observed in the area of the hydroclarifier (Figure 34). The data indicate minor transport of zinc from the UBZ to the LBZ may have occurred.

#### 4. TEMPORAL TRENDS OF CONSTITUENTS IN GROUNDWATER

The temporal trend of a constituent refers to changes in the constituent's groundwater concentration through time at a location in the aquifer. When a constituent is first input to the groundwater, the trends are increasing at down-gradient locations, as the concentration is rising. If the source is stopped the concentrations eventually decline and the trend is decreasing.

Two types of trends are observed in the groundwater plumes below the Monsanto plant. The dominant trend is one of decreasing concentrations at most sampling locations. This trend is consistent with the Plant history, which includes a period from the middle 1950s to the early 1980s when releases of constituents to the subsurface occurred. In the past several years since these releases have stopped, the groundwater concentrations for the constituents have declined. The second type of trend, which is a minor trend in that it does not occur at all locations below the Plant, is one of increasing concentrations. This trend is not well explained by the Plant history, it involves only a few constituents, and it is localized to two areas--the area of the old underflow solids ponds and the area of the hydroclarifier.

Figures 35 through 38 show time history plots of groundwater concentration for cadmium and chloride in the areas of the groundwater plumes below the Monsanto plant. Where a declining trend was observed in these data, a function was fit through the data points by regression and is also shown on the plot. Appendix A contains plots for the other constituents of potential interest in the areas of the old underflow solids ponds and the northwest pond/hydroclarifier with the exception of selenium. Data for selenium were found to be incorrect prior to the more recent sampling, thus, time history data exist for only a short period and were not plotted.

As shown on Figures 35 and 36, cadmium concentrations in the plume areas appear to be declining. Although the data values fluctuate, the dominant trend shown by the regression curve indicates a declining trend. Table 4 presents information concerning the regression at each location and includes an estimate of the time at which the cadmium concentration should decline to 0.005 mg/L, which is the common detection limit for the groundwater samples.

Figures 37 and 38 present time history groundwater concentrations for chloride in the plume areas. The chloride data show both of the trends discussed above. As shown on Figure 37, near to the old underflow solids ponds (Test Wells 22 and 37), steeply declining trends are observed, whereas away from the ponds, increasing trends are observed (Test Well 36 and Mormon A Spring). In reviewing the Plant history and the available sources of constituents, the explanation for these increasing trends was not clear. At this time it appears most likely that the old underflow solids ponds were used during the early 1980s and were filled with liquids containing chloride and possibly other constituents. This use of the ponds may have resulted in a short duration pulse-type release to groundwater and caused the chloride distribution observed in the UBZ. The chloride concentration in the source area is currently near background and is continuing

to decline. Sulfate, nitrate, and a few other constituents have concentrations following a pattern similar to chloride, although the concentrations are more dilute and the increasing trends are not as apparent.

Chloride concentrations in the area of the northwest pond/hydroclarifier (Test Wells 16, 40, 42, and 43) also show a mixture of trends. At Test Well 16, which is located immediately southeast of the northwest pond, the chloride trend is steeply declining. At Test Wells 40, 42, and 43, located in the area of the hydroclarifier, the chloride concentration trends are less clear. The current trend at Test Well 42 appears to be increasing. The trends observed in water quality data from Test Wells 40 and 43 are declining, although the data show large fluctuations at early times and fluctuations may occur in the future. Table 5 presents data for the regression curves shown on Figures 37 and 38.

## 5. PRODUCTION WELL AREA

The production wells for the Monsanto plant, PW-1, PW-2, and PW-3, are known to withdraw groundwater from the area of the northwest pond/hydroclarifier plume (Figures 2 and 3). The wells for several years have withdrawn the plume from the aquifer and prevented the off-site migration of the plume. EPA has raised the question concerning the disposition of the plume if the production wells were shut down.

In the event the production wells are indefinitely taken off-line, the following conditions are anticipated to result:

- Groundwater flow will no longer be directed toward the production wells in the center of the Plant;
- Groundwater flow will eventually shift to an approximately uniform pattern directed toward the southeast, parallel to the main fault that occurs in the western part of the Plant;
- The northwest pond/hydroclarifier plume will migrate further to the southeast in the direction of groundwater flow;
- The Kerr-McGee plume, to the east of the Monsanto plant, will migrate toward the south rather than toward the west and south; and
- If the northwest pond/hydroclarifier plume migrates to the southeast corner of the Plant, the plume will coalesce with the Kerr-McGee plume.

## 6. CONCLUSIONS

Three areas below the Monsanto plant are occupied by plumes of constituents released to groundwater earlier in the Plant history. The main plume areas correspond to the northwest pond, the hydroclarifier, the old underflow solids ponds, and the southwest corner of the Plant. A fourth plume exists along the eastern fence-line of the Plant and is attributed to industrial activities to the east of the Plant. Time history data for groundwater quality indicates in most cases that concentrations are declining, which is consistent with the Plant history.

Increasing concentrations also are observed in isolated areas for selected constituents, and in particular chloride. These trends are not apparent for many of the metal constituents. The increasing trends are most notably observed along the southern fence-line and an explanation for the trends is not well substantiated. It is possible, however, that these observations are a result of a pulse-type release to groundwater that occurred through the old underflow solids ponds in the early 1980s. The release may have taken place sometime after the ponds were taken out of use and before the ponds were capped. The short duration of the release may have formed a plume that migrates through the aquifer as a pulse. As the pulse arrives at down-gradient locations concentrations increase and as the pulse passes concentrations eventually decline. Consequently, the increasing trends that are observed today are expected to shift to declining trends in the future. Based on observations in test wells 37 and 22, which are nearer to the source, declining trends are estimated to occur along the southern fence-line in the next few years.

## 7. REFERENCES

Golder, 1992a, Phase I Remedial Investigation/Feasibility Study Preliminary Site Characterization Summary Report for the Soda Springs Elemental Phosphorous Plant, Report to Monsanto Company by Golder Associates Inc., Redmond, WA.

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## TABLES

**TABLE 1**

**SAMPLE ANALYSIS FOR MAY 1993 GROUNDWATER AND SPRING SAMPLES**

<b>Metals</b>	<b>Other Ions</b>	<b>Other</b>
Aluminum	Ammonium	Total Dissolved Solids
Arsenic	Chloride	Specific Conductance <sup>1</sup>
Cadmium	Fluoride	pH <sup>1</sup>
Iron	Nitrate + Nitrate as N	Eh <sup>2</sup>
Manganese	Sulfate	Turbidity <sup>2</sup>
Molybdenum		Temperature <sup>2</sup>
Nickel		Dissolved Oxygen <sup>2</sup>
Selenium		
Vanadium		
Zinc		

<sup>1</sup> Analyzed in field and in laboratory. <sup>2</sup> Analyzed in field only.

**TABLE 2****GROUNDWATER QUALITY STATISTICS FOR THE UPPER BASALT ZONE  
DURING MAY 1993**

Analyte	Mean	Std. Deviation	Minimum	Maximum	Sample Size	No. Undetected
Aluminum	0.056	0.044	0.01U	0.199	53	44
Arsenic	0.003	0.004	0.001U	0.021	53	37
Cadmium	0.173	0.622	0.005U	3.82	53	35
Chloride	117.9	126.3	5.1	513	53	0
Fluoride	1.94	2.59	0.13	13.8	53	0
Iron	0.52	1.43	7.65	0.027	53	18
Manganese	0.164	0.293	0.004U	1.47	53	9
Molybdenum	0.265	0.789	0.008U	4.17	53	14
Nickel	0.03	0.016	0.003U	0.112	53	44
Nitrate	6.28	4.68	0.02U	16.7	51	6
Selenium	0.132	0.178	0.001U	0.7	53	17
Sulfate	244.2	200.2	32.9	902	53	0
Vanadium	0.202	0.719	0.004U	4.03	53	30
Zinc	0.459	1.22	0.005U	6.36	53	25

Values are in units of mg/L; Kerr-McGee monitoring well samples were not included in statistical calculations; Undetected values (qualifier U) were used at full value in the calculations.

TABLE 3

GROUNDWATER QUALITY STATISTICS FOR THE LOWER BASALT ZONE  
DURING MAY 1993

Analyte	Mean	Std. Deviation	Minimum	Maximum	Sample Size	No. Undetected
Aluminum	0.049	0.051	0.021U	0.139	8	7
Arsenic	0.003	0.003	0.001U	0.010	8	3
Cadmium	0.012	0.015	0.005U	0.048	8	4
Chloride	58.36	67.49	13.1	217	8	0
Fluoride	0.333	0.204	0.16	0.77	8	0
Iron	6.92	5.28	14.2	0.075	8	1
Manganese	0.297	0.228	0.012U	0.668	8	1
Molybdenum	0.062	0.13	0.008U	0.382	8	5
Nickel	0.027	0.004	0.026U	0.036	8	7
Nitrate	1.84	3.48	0.02U	8.94	8	6
Selenium	0.003	0.002	0.001U	0.005U	8	8
Sulfate	158.3	149.3	60.7	490	8	0
Vanadium	0.572	1.59	0.009U	4.5	8	5
Zinc	0.071	0.062	0.014U	0.208	8	5

Values are in units of mg/L; Kerr-McGee monitoring well samples were not included in statistical calculations; Undetected values (qualifier U) were used at full value in the calculations.

**TABLE 4****REGRESSION ANALYSES FOR CADMIUM AT SELECTED TEST WELLS**

Test Well	Decay Rate, $\text{yr}^{-1}$ (Half Life, $\text{yr}$ ) <sup>a</sup>	Predicted Year for Concentration Decline to Background (0.005U mg/L) <sup>b</sup>
TW-16	0.101 (7)	2040
TW-40	0.178 (4)	2030
TW-42	0.379 (2)	2002
TW-43	0.030 (23)	2238
TW-37	0.128 (6)	2027
TW-22	0.113 (6)	2004
TW-36	0.044 (16)	2047
Mormon A Spring	0.062 (12)	2007

<sup>a</sup> The regression model consisted of the function  $C(t) = C_0 \exp(-rt)$ , where  $C(t)$  is the concentration at time  $t$  (mg/L),  $C_0$  is the initial concentration at time  $t = 0$  (mg/L),  $r$  is the decay rate ( $\text{yr}^{-1}$ ), and  $t$  is the time (yr). Both of the parameters,  $r$  and  $C_0$ , are computed by least-squares linear regression of  $\ln(C(t))$  vs.  $t$ . According to this function,  $C(t)$  approaches 0 mg/L as the time,  $t$ , approaches infinity. The half life is obtained from the decay rate according to  $\ln(2)/r$  and has units of years.

<sup>b</sup> The regression model was used to predict the year at which the concentration at the observation location may decline to a concentration of 0.005 mg/L, a value representative of background that was determined from Test Well 57 (background is measured as 0.005U mg/L). This year is predicted by the following expression,  $T = \ln(0.005/C_0)/r$ . Caution must be used in interpreting these results as the predicted year is beyond the range of the data.

TABLE 5

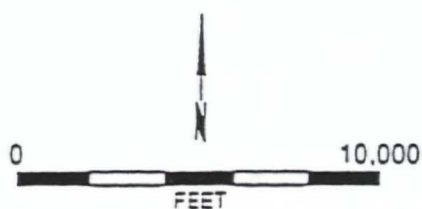
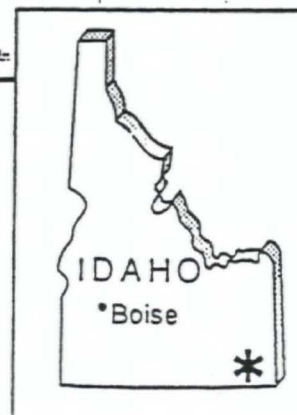
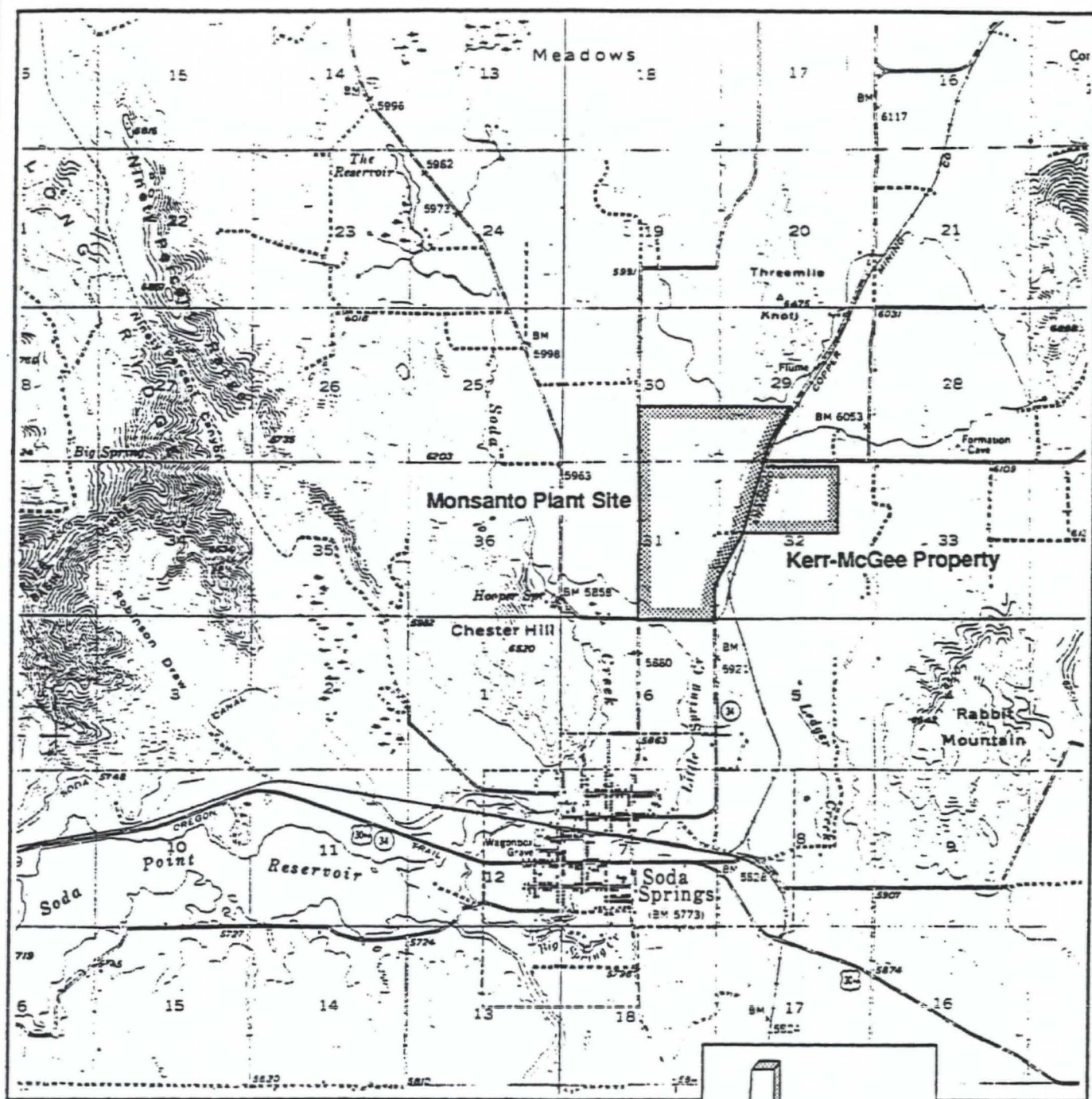
## REGRESSION ANALYSES FOR CHLORIDE AT SELECTED TEST WELLS

Test Well	Decay Rate, $\text{yr}^{-1}$ (Half Life, $\text{yr}$ ) <sup>a</sup>	Predicted Year for Concentration Decline to Background (22 mg/L) <sup>b</sup>
TW-16	0.126 (6)	1998
TW-40	0.035 (20)	2082
TW-42	—	—
TW-43	0.068 (10)	2040
TW-37	0.183 (4)	1998
TW-22	0.223 (3)	1997
TW-36	—	—
Mormon A Spring	—	—

<sup>a</sup> The regression model consisted of the function  $C(t) = C_0 \exp(-rt)$ , where  $C(t)$  is the concentration at time  $t$  (mg/L),  $C_0$  is the initial concentration at time  $t = 0$  (mg/L),  $r$  is the decay rate ( $\text{yr}^{-1}$ ), and  $t$  is the time (yr). Both of the parameters,  $r$  and  $C_0$ , are computed by least-squares linear regression of  $\ln(C(t))$  vs.  $t$ . According to this function,  $C(t)$  approaches 0 mg/L as the time,  $t$ , approaches infinity. The half life is obtained from the decay rate according to  $\ln(2)/r$  and has units of years.

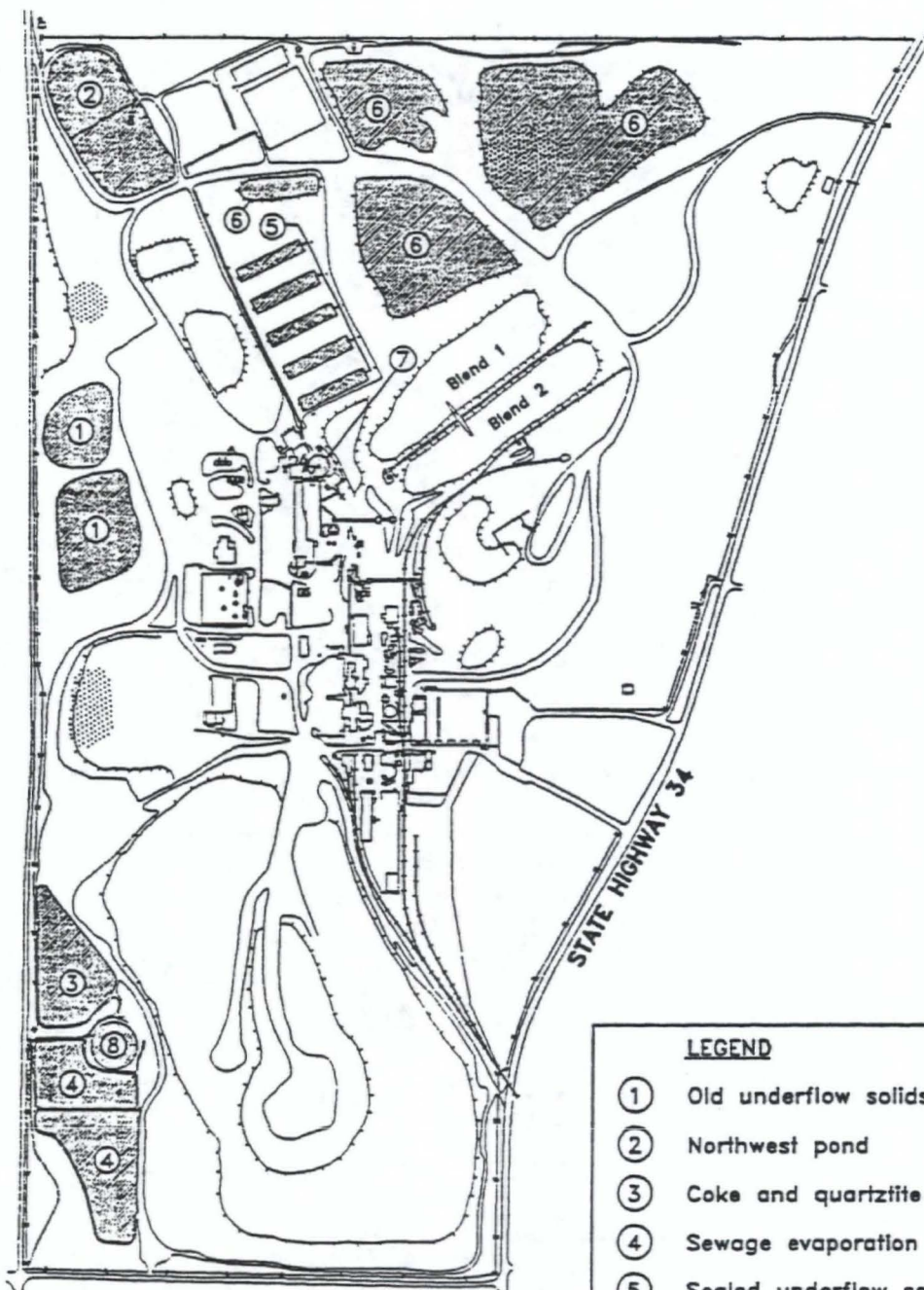
<sup>b</sup> The regression model was used to predict the year at which the concentration at the observation location may decline to a concentration of 22 mg/L, a value representative of background that was determined from Test Well 57. This year is predicted by the following expression,  $T = \ln(0.005/C_0)/r$ . Caution must be used in interpreting these results, as the predicted year is beyond the range of the data.

FIGURES



SOURCE: Topographic Map of the USGS  
Soda Springs Quadrangle (1:62,500) 1948

FIGURE 1  
LOCATION MAP  
MONSANTO/PHASE II R/I/D

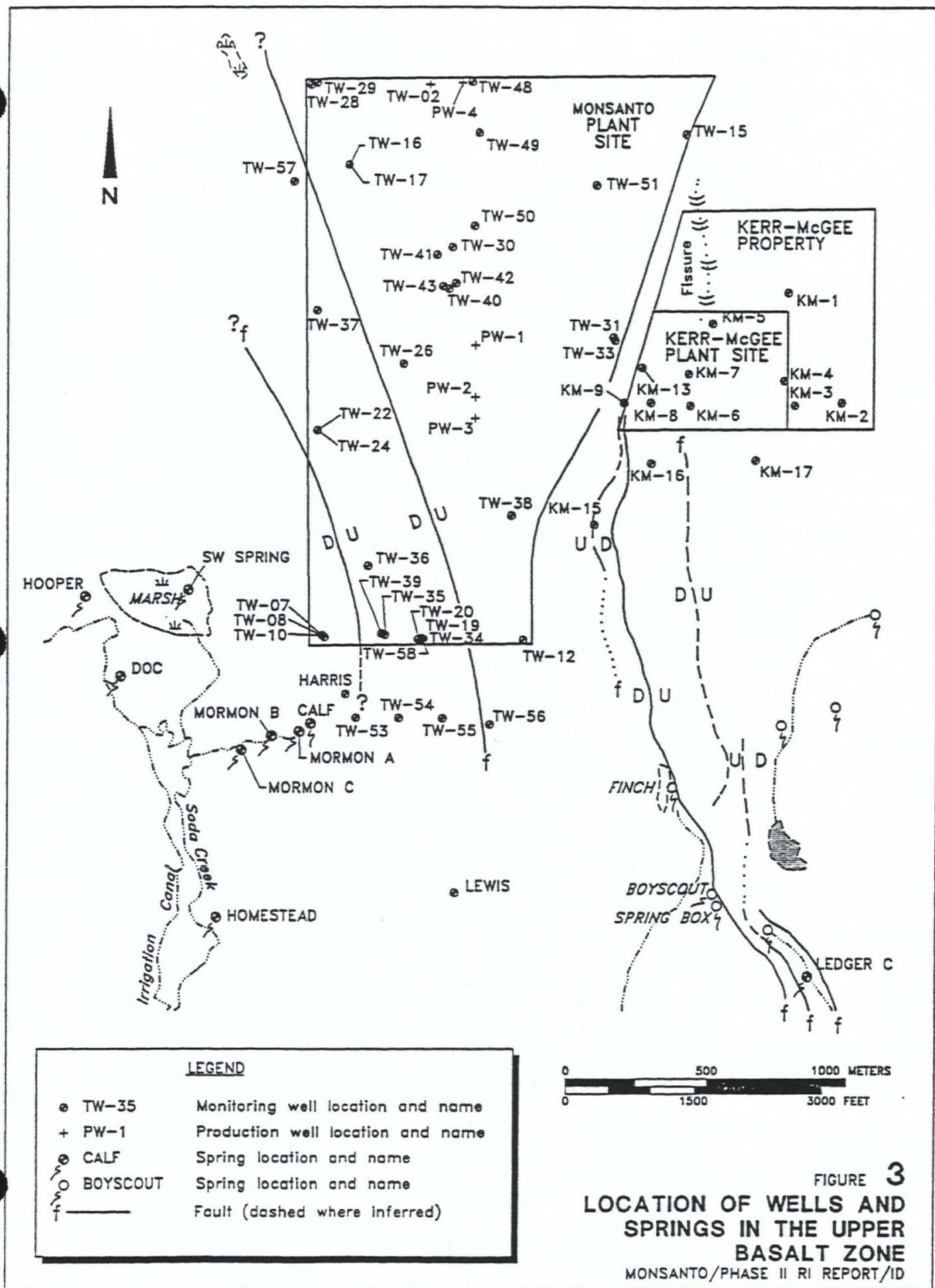


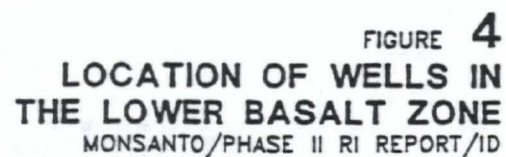
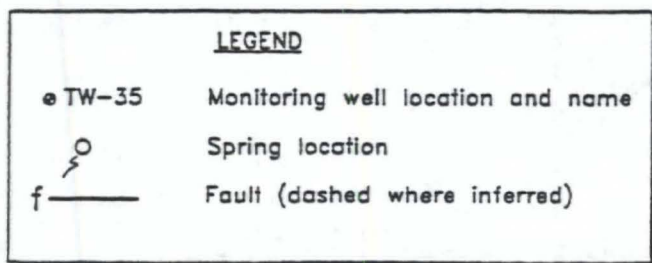
# **LEGEND**

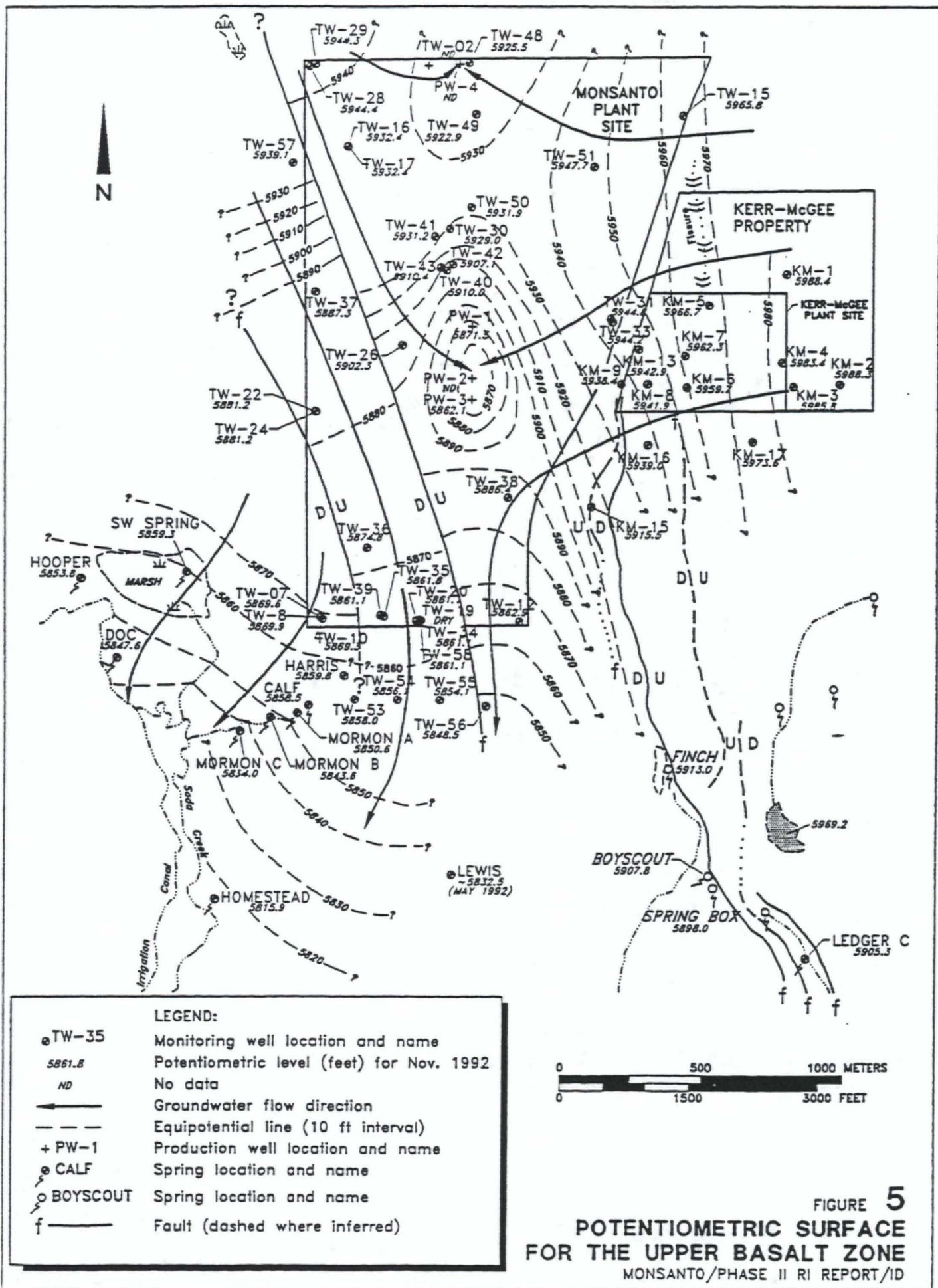
- ① Old underflow solids ponds
- ② Northwest pond
- ③ Coke and quartzite dust slurry pond
- ④ Sewage evaporation ponds
- ⑤ Sealed underflow solids ponds
- ⑥ Underflow solids piles
- ⑦ Hydroclarifier
- ⑧ Non-contact cooling water settling pond

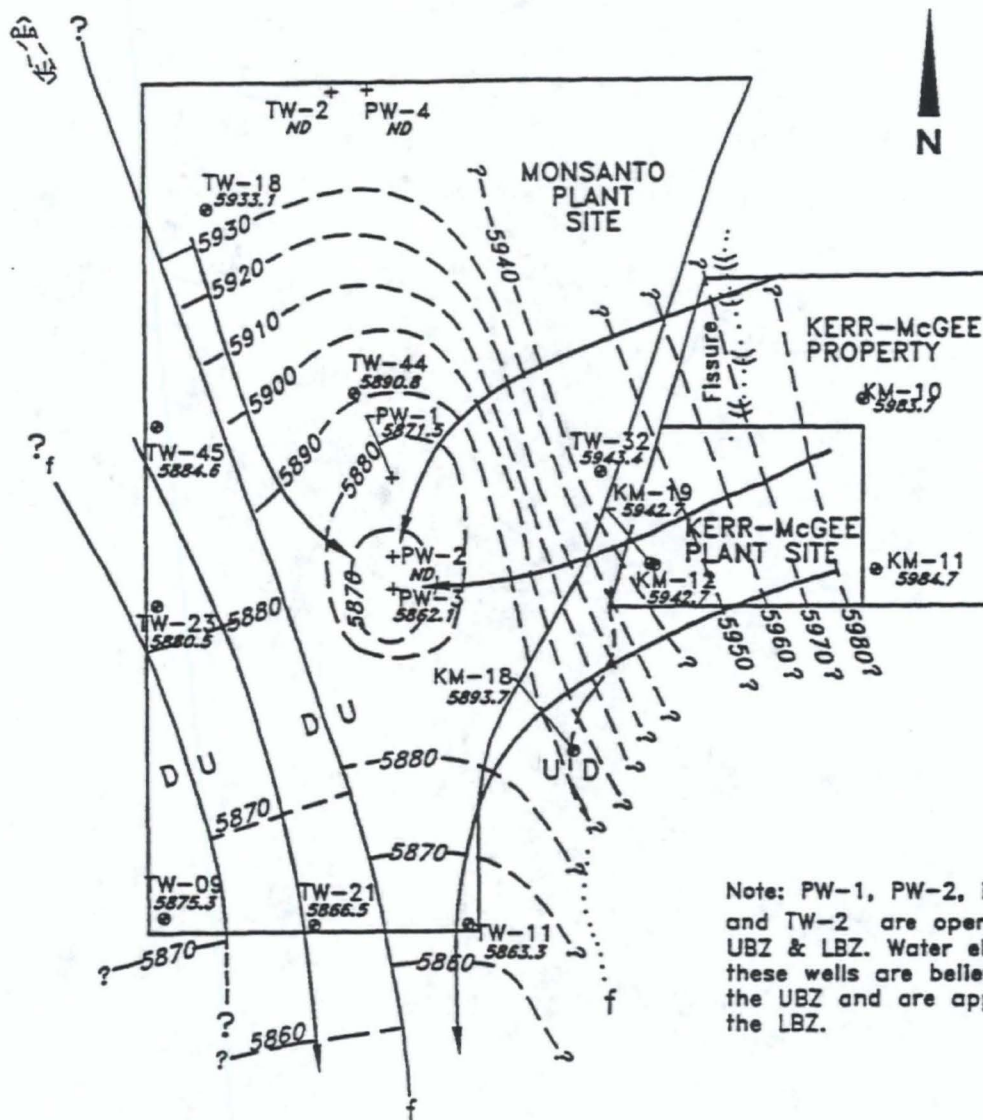
0 300 600 METERS  
0 1000 2000 FEET

**FIGURE 2**  
**SOURCE LOCATION MAP**  
MONSANTO/PHASE I RI/ID









Note: PW-1, PW-2, PW-3, PW-4, and TW-2 are open to both the UBZ & LBZ. Water elevations for these wells are believed to represent the UBZ and are approximations of the LBZ.

#### LEGEND

- TW-35 Monitoring well location and name
- + PW-1 Production well location and name
- Spring location
- 5863.3 Potentiometric level (feet) for Nov. 1992.
- ND No data
- Groundwater flow direction
- - - Equipotential line (10 ft interval)
- f Fault (dashed where inferred)

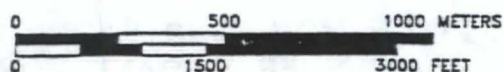
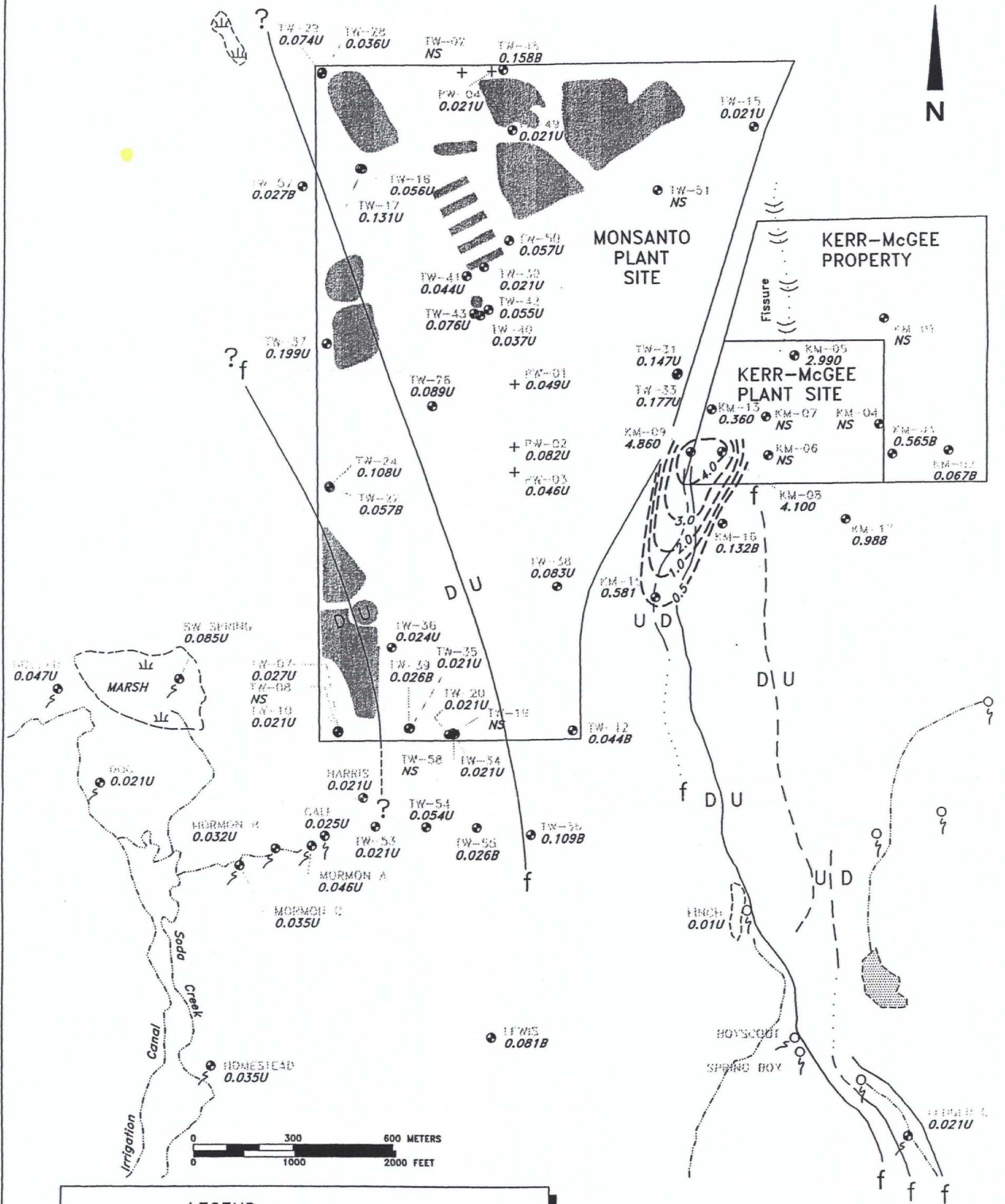


FIGURE 6  
POTENTIOMETRIC SURFACE FOR  
THE LOWER BASALT ZONE  
MONSANTO/PHASE II RI REPORT/ID



# **LEGEND**

- TW-35 Monitoring well location and name
- + PW-01 Production well location and name
- CALF Spring location and name (if sampled)
- BOYS-COOT Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
CRDL = Contract Required Detection Limit  
IDL = Instrument Detection Limit  
U = Undetected  
B = Detected between the CRDL and IDL  
J = Estimated below IDL
- NS No sample collected
- 100 — — Concentration contour (mg/l)
- f — — — Fault (dashed where inferred)

**FIGURE 7**  
**ALUMINUM GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID

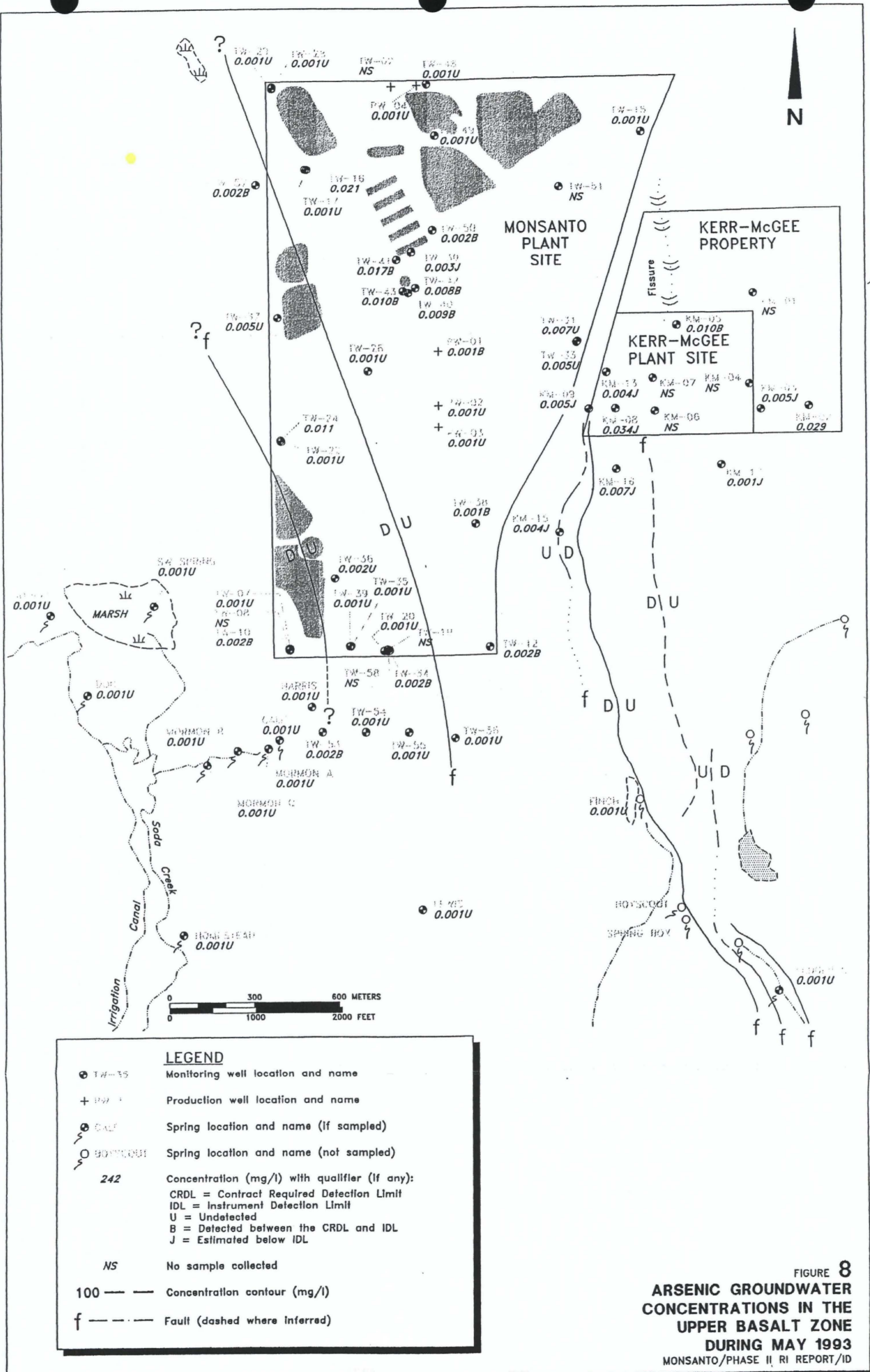
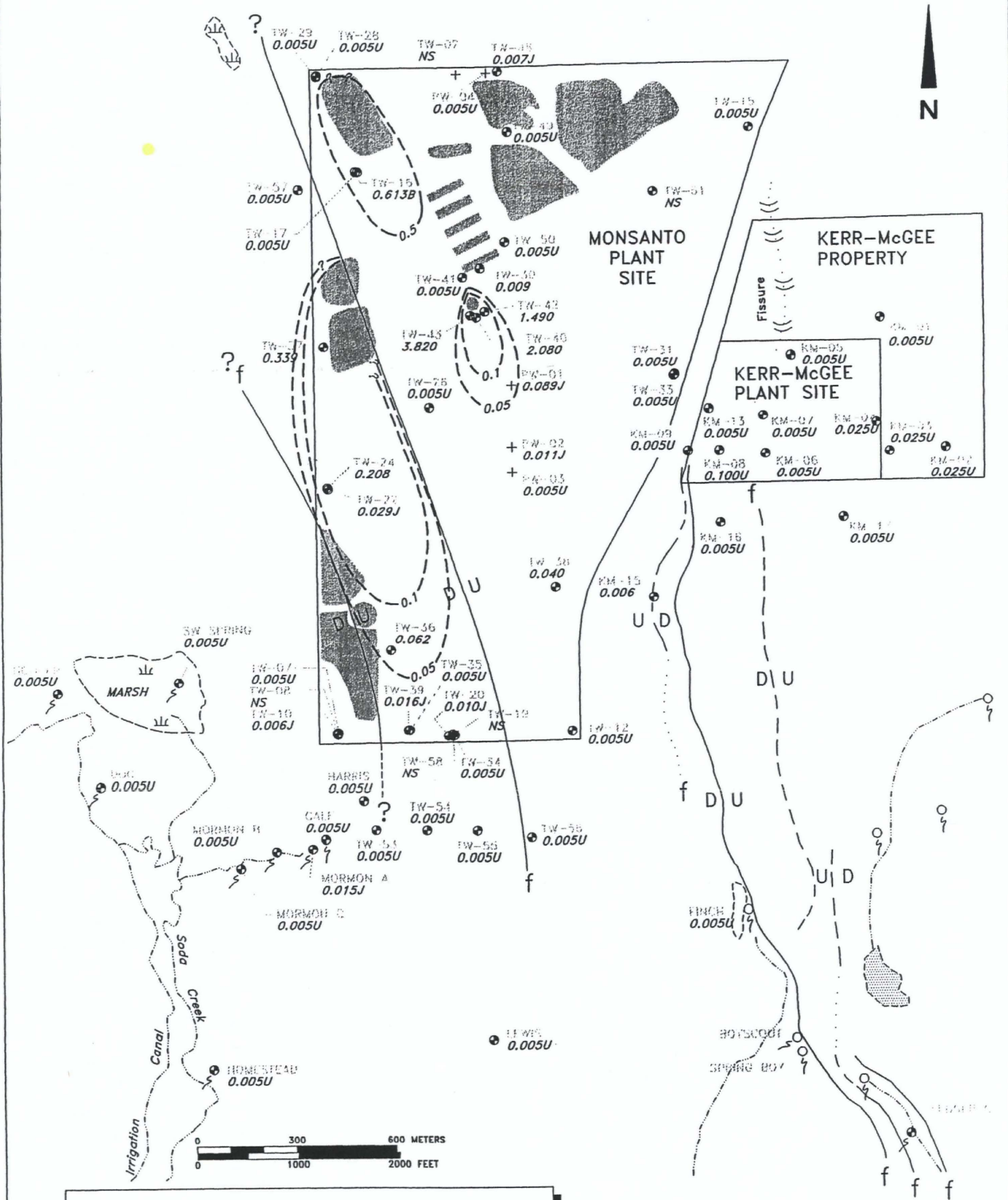


FIGURE 8  
**ARSENIC GROUNDWATER  
 CONCENTRATIONS IN THE  
 UPPER BASALT ZONE  
 DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID

Golder Associates

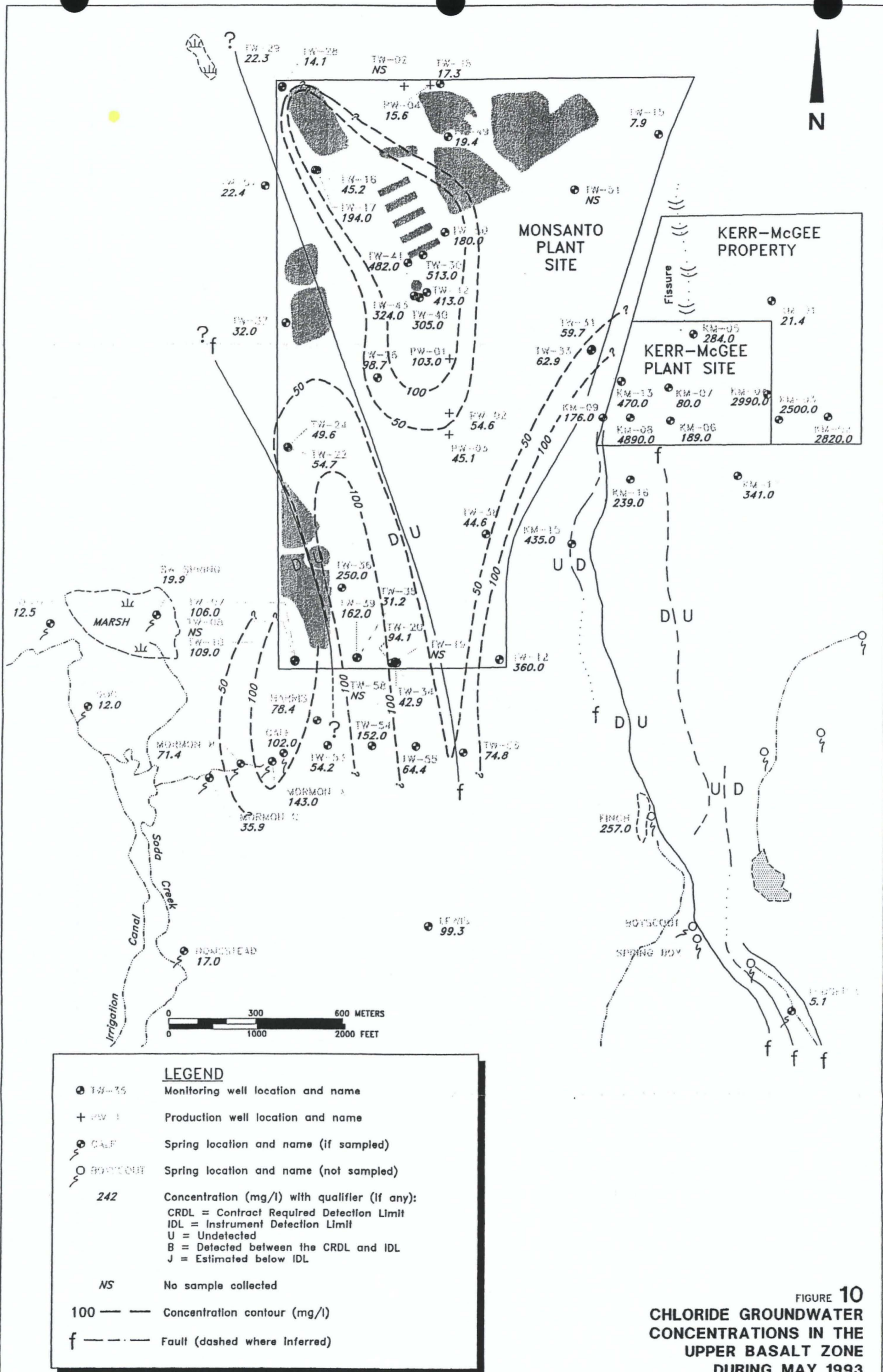


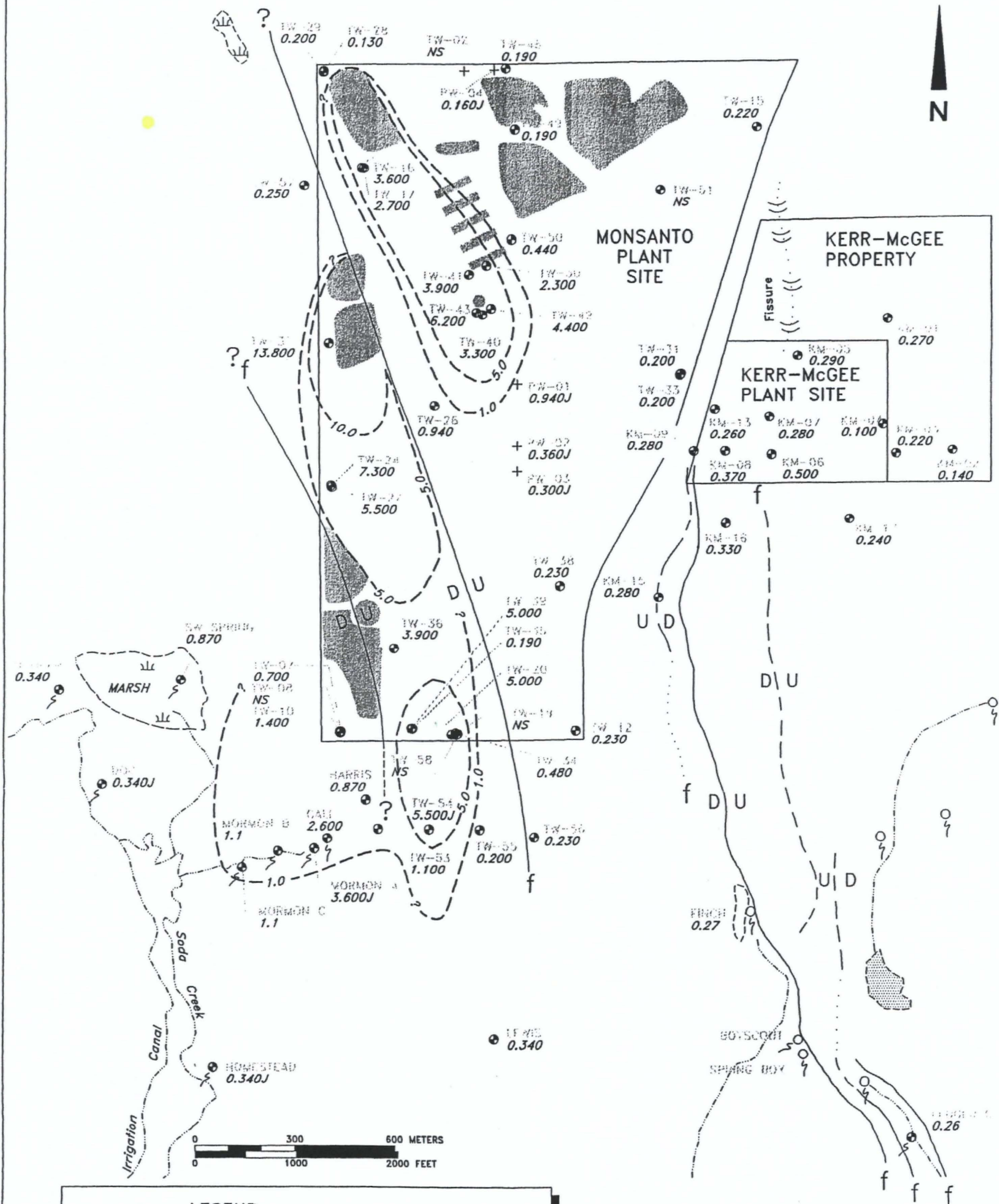
# **LEGEND**

- TW-35 Monitoring well location and name
- + PW-1 Production well location and name
- Calf Spring location and name (if sampled)
- Scout Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
CRDL = Contract Required Detection Limit  
IDL = Instrument Detection Limit  
U = Undetected  
B = Detected between the CRDL and IDL  
J = Estimated below IDL
- NS No sample collected
- 100 — Concentration contour (mg/l)
- f — Fault (dashed where inferred)

**FIGURE 9**  
**CADMIUM GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID

Golder Associates

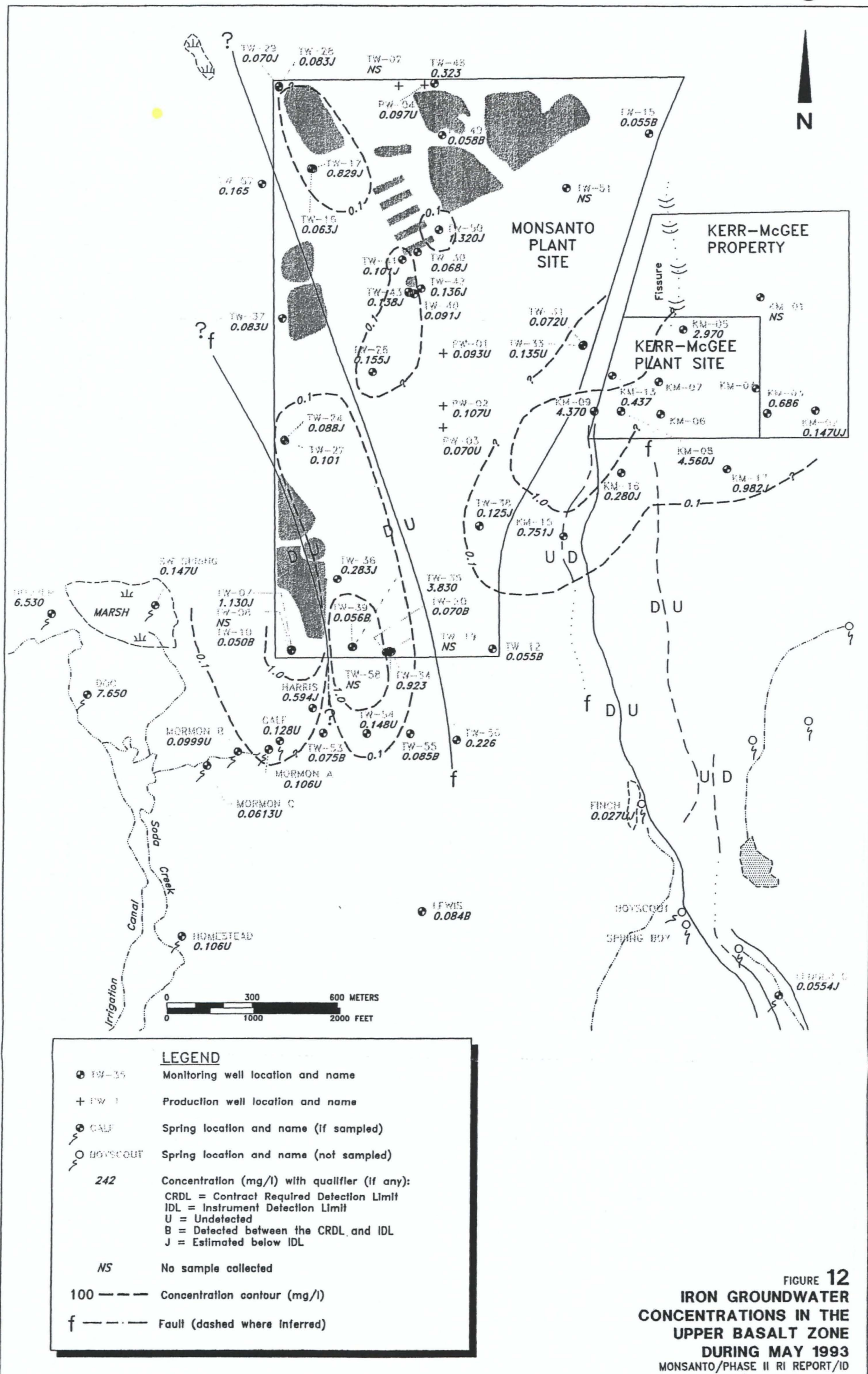




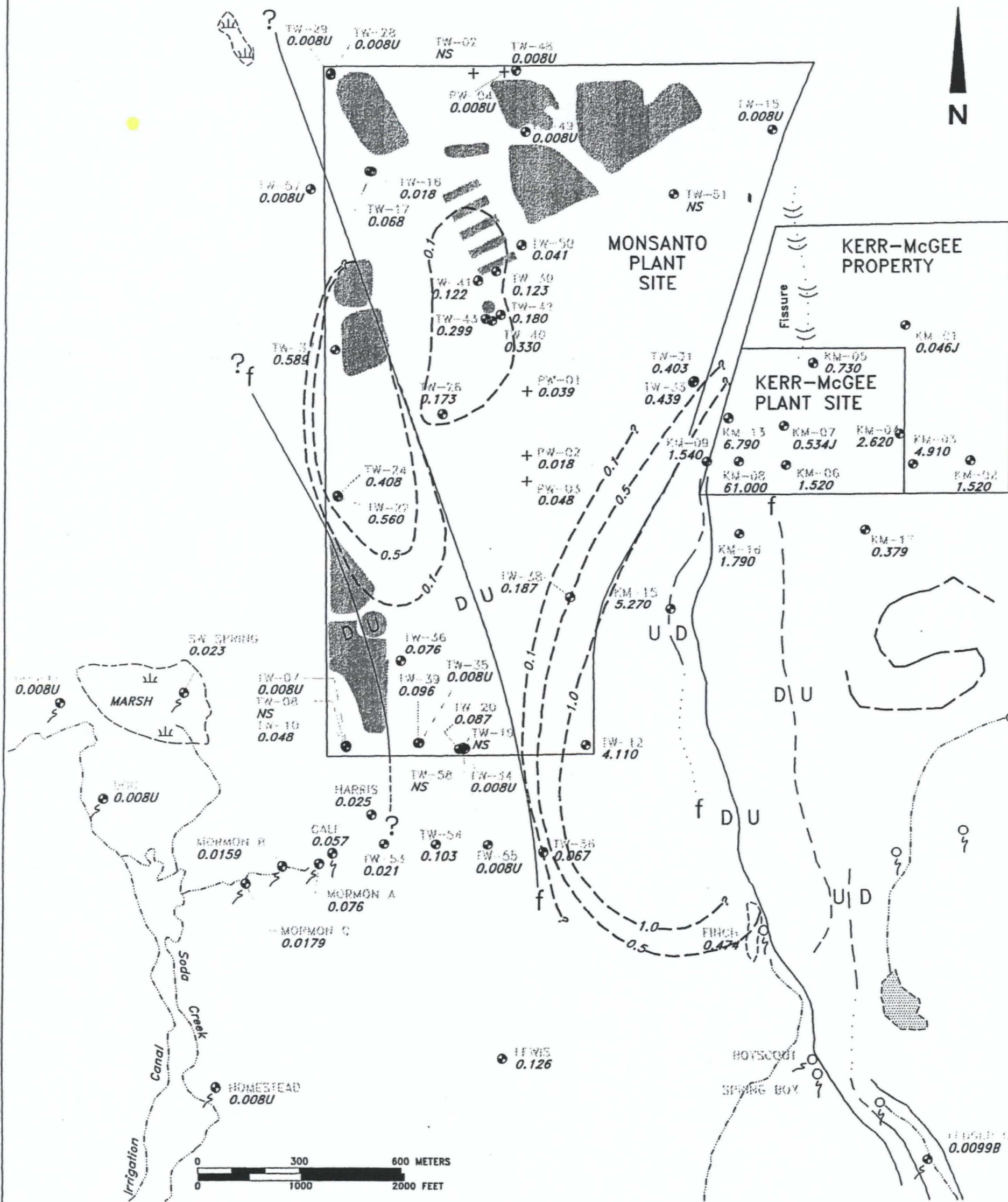
# LEGEND

- TW-01 Monitoring well location and name
- + PW-01 Production well location and name
- Calf Spring location and name (if sampled)
- Boy Scout Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
CRDL = Contract Required Detection Limit  
IDL = Instrument Detection Limit  
U = Undetected  
B = Detected between the CRDL and IDL  
J = Estimated below IDL
- NS No sample collected
- 100 — — Concentration contour (mg/l)
- f — — — Fault (dashed where inferred)

**FIGURE 11**  
**FLUORIDE GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID



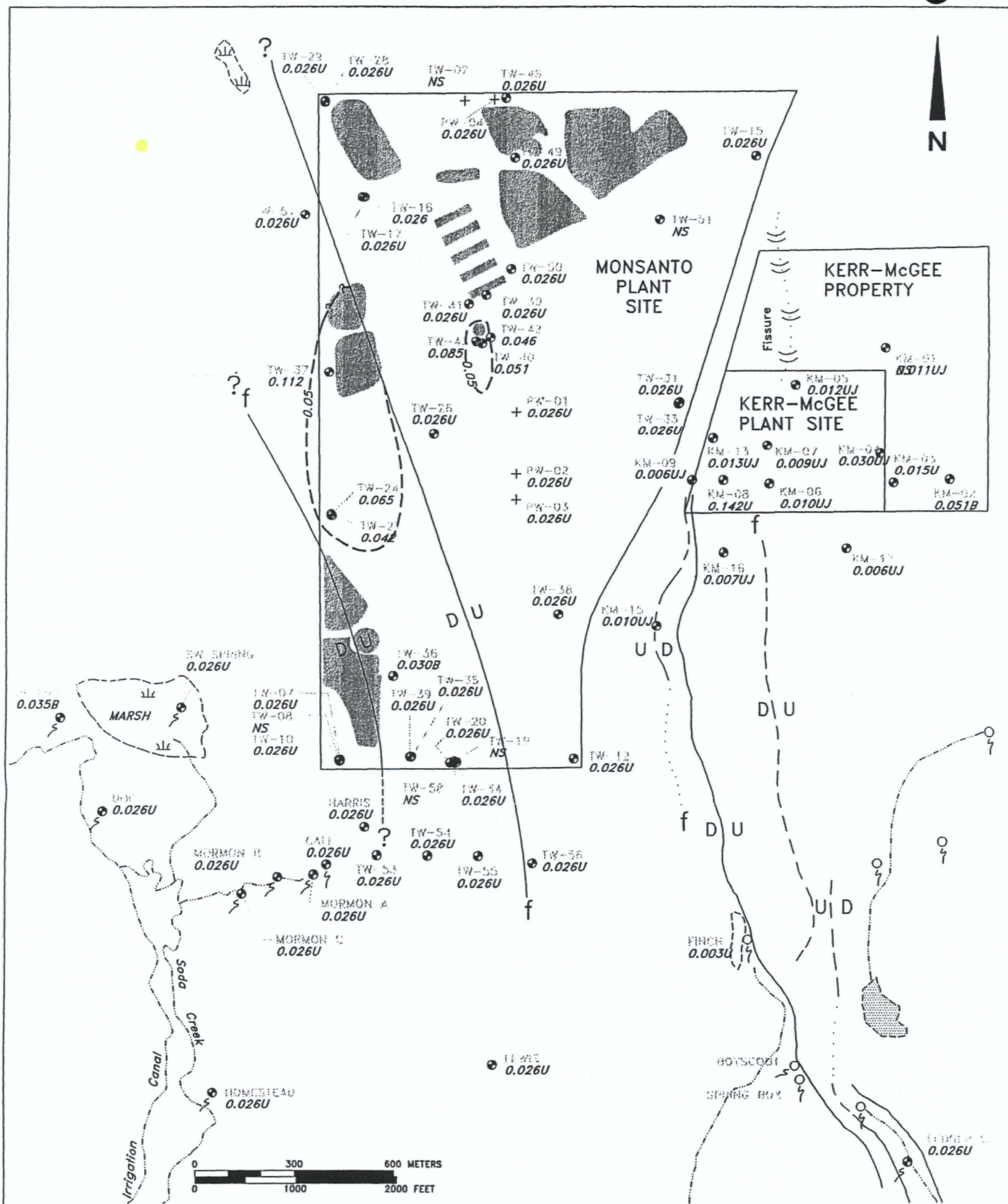




**LEGEND**

- TW-01 Monitoring well location and name
- + PW-01 Production well location and name
- CALI Spring location and name (if sampled)
- BOYSCOUT Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
 CRDL = Contract Required Detection Limit  
 IDL = Instrument Detection Limit  
 U = Undetected  
 B = Detected between the CRDL and IDL  
 J = Estimated below IDL
- NS No sample collected
- 100 — — Concentration contour (mg/l)
- f — — — Fault (dashed where inferred)

**FIGURE 14**  
**MOLYBDENUM GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID

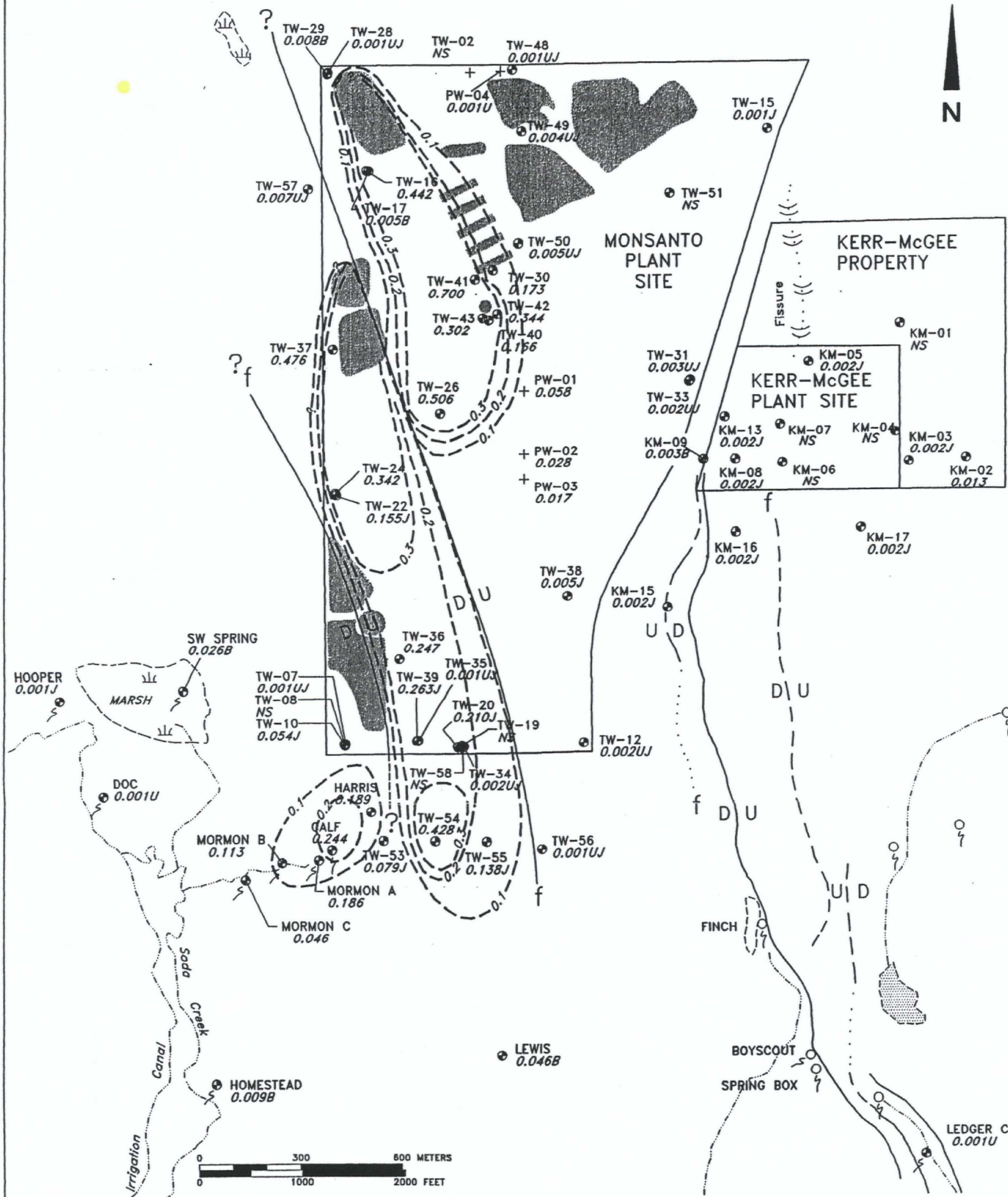


**LEGEND**

- TW-15 Monitoring well location and name
- + PW-1 Production well location and name
- CALF Spring location and name (if sampled)
- BOYSCOUT Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
 CRDL = Contract Required Detection Limit  
 IDL = Instrument Detection Limit  
 U = Undetected  
 B = Detected between the CRDL and IDL  
 J = Estimated below IDL
- NS No sample collected
- 100 — — Concentration contour (mg/l)
- f — — — Fault (dashed where inferred)

FIGURE 15  
**NICKEL GROUNDWATER  
 CONCENTRATIONS IN THE  
 UPPER BASALT ZONE  
 DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID

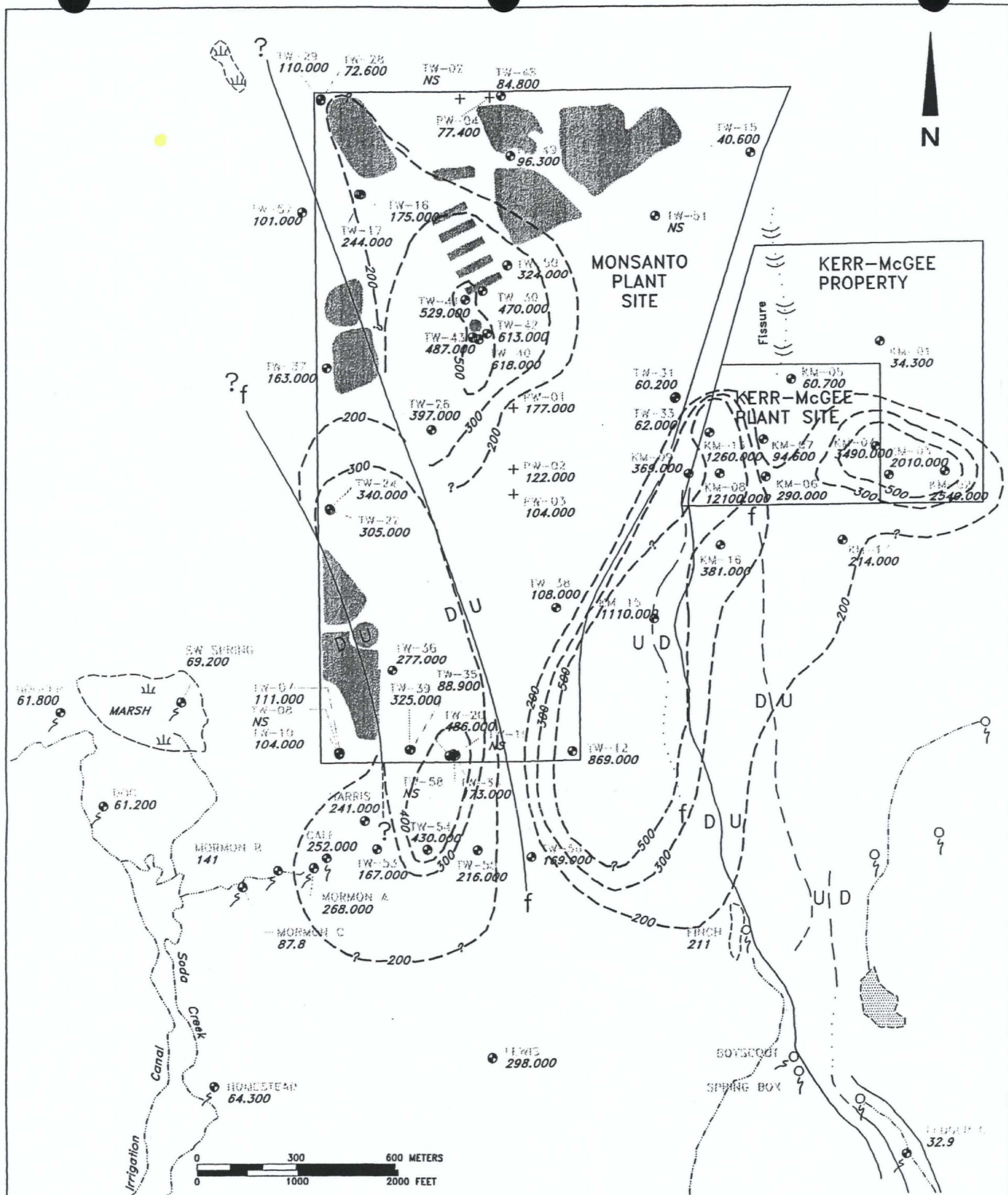




### LEGEND

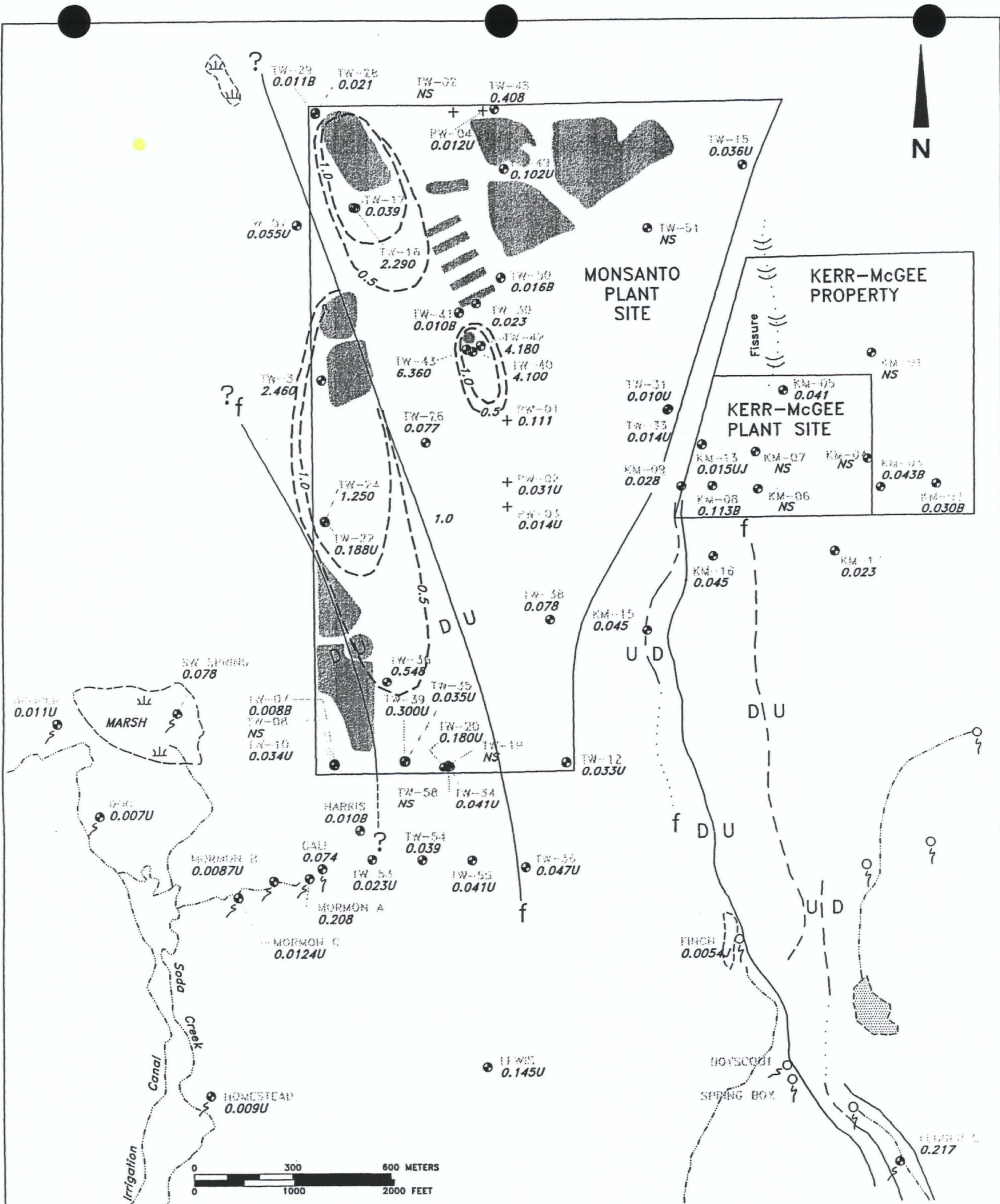
- TW-35 Monitoring well location and name
- + PW-1 Production well location and name
- CALF Spring location and name (if sampled)
- BOYSCOUT Spring location and name (not sampled)
- 242 Concentration (mg/l) with qualifier (if any):  
 CRDL = Contract Required Detection Limit  
 IDL = Instrument Detection Limit  
 U = Undetected  
 B = Detected between the CRDL and IDL  
 J = Estimated below IDL
- NS No sample collected
- 100 — — Concentration contour (mg/l)
- f — — — Fault (dashed where inferred)

FIGURE 17  
 SELENIUM GROUNDWATER  
 CONCENTRATIONS IN THE  
 UPPER BASALT ZONE  
 DURING MAY 1993  
 MONSANTO/PHASE II RI REPORT/ID



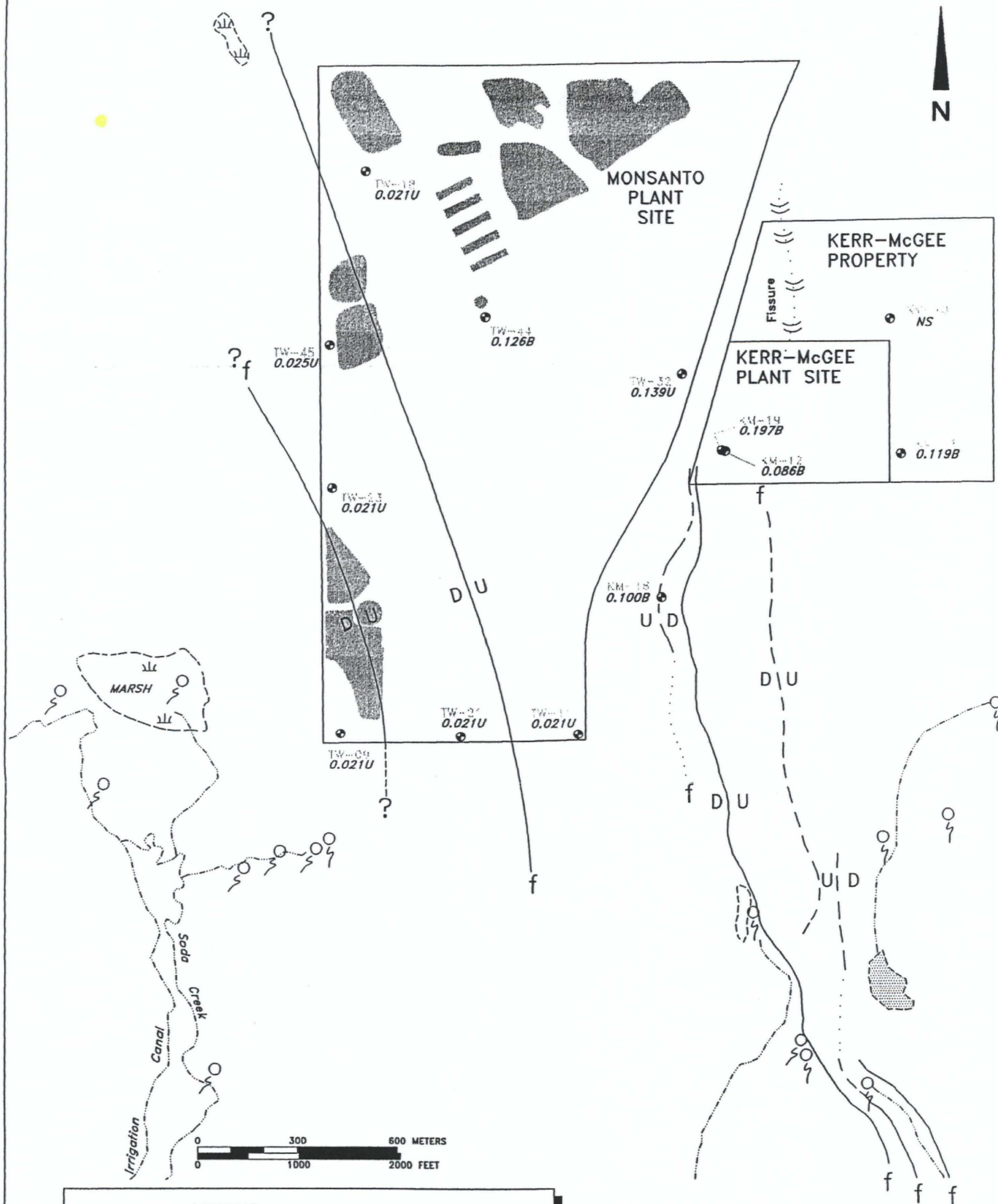
**FIGURE 18**  
**SULFATE GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
**MONSANTO/PHASE II RI REPORT/ID**





- LEGEND**
- TW-35 Monitoring well location and name
  - + PW-1 Production well location and name
  - GALT Spring location and name (if sampled)
  - HOYSCOOK Spring location and name (not sampled)
  - 242 Concentration (mg/l) with qualifier (if any):  
CRDL = Contract Required Detection Limit  
IDL = Instrument Detection Limit  
U = Undetected  
B = Detected between the CRDL and IDL  
J = Estimated below IDL
  - NS No sample collected
  - 100 — — Concentration contour (mg/l)
  - f — — — Fault (dashed where inferred)

**FIGURE 20**  
**ZINC GROUNDWATER**  
**CONCENTRATIONS IN THE**  
**UPPER BASALT ZONE**  
**DURING MAY 1993**  
 MONSANTO/PHASE II RI REPORT/ID



LEGEND	
● TW-35	Monitoring well location and name
+ FW-1	Production well location and name
● Calf	Spring location and name (if sampled)
○ Boy Scout	Spring location and name (not sampled)
242	Concentration (mg/l) with qualifier (if any):
	CRDL = Contract Required Detection Limit
	IDL = Instrument Detection Limit
	U = Undetected
	B = Detected between the CRDL and IDL
	J = Estimated below IDL
NS	No sample collected
100 — —	Concentration contour (mg/l)
f — — —	Fault (dashed where inferred)

FIGURE 21  
ALUMINUM GROUNDWATER  
CONCENTRATIONS IN THE  
LOWER BASALT ZONE  
DURING MAY 1993  
MONSANTO/PHASE II RI REPORT/ID



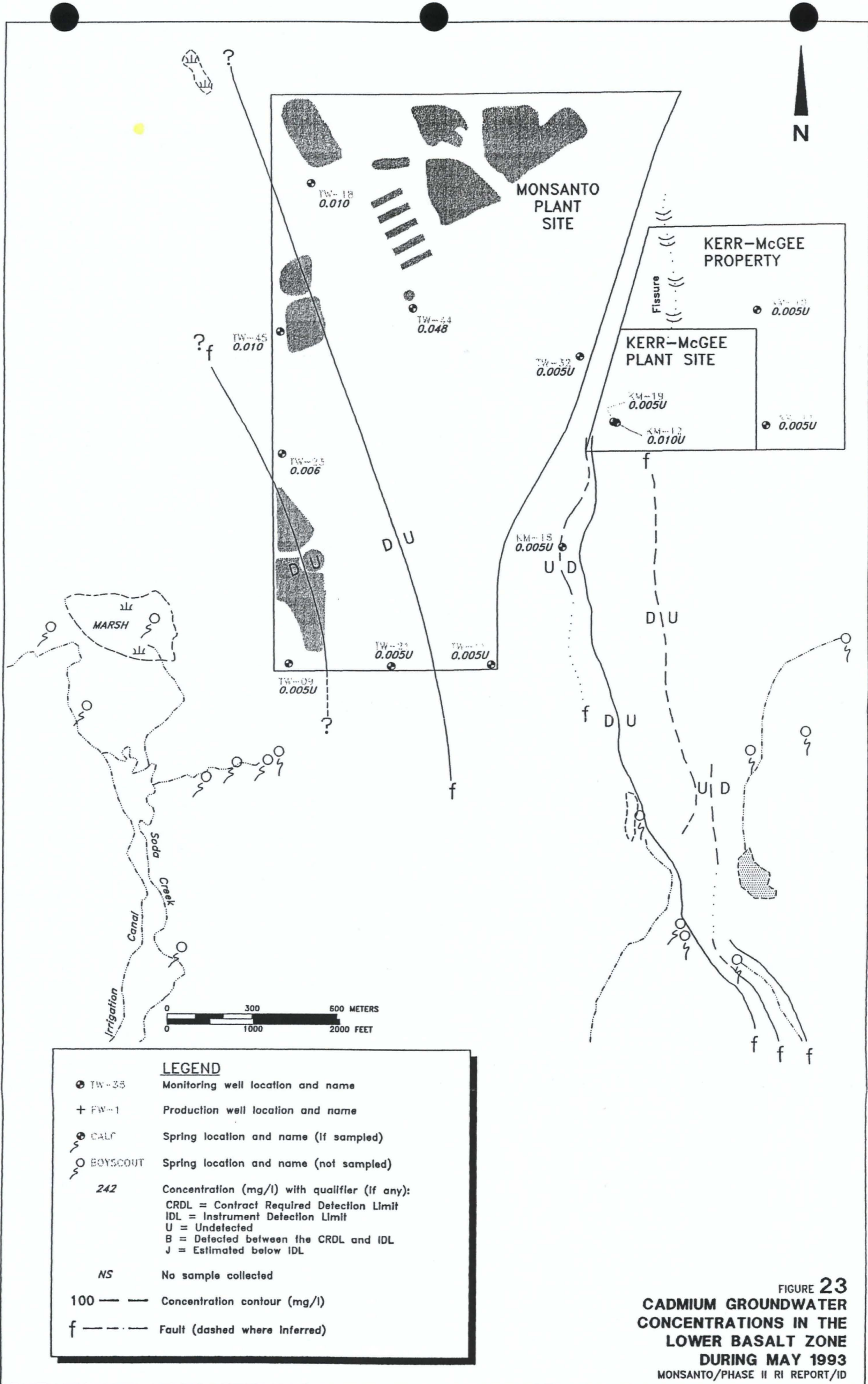
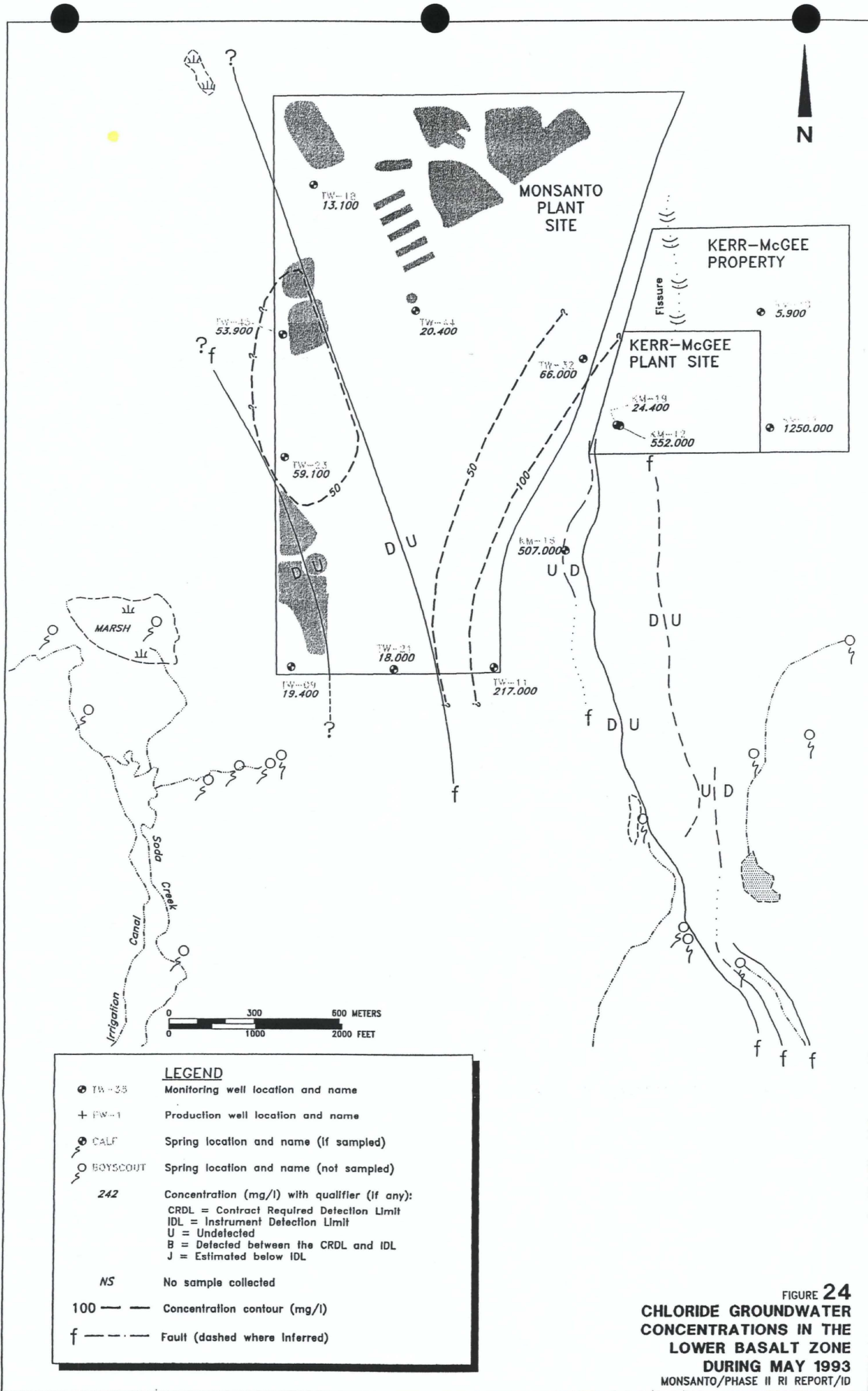
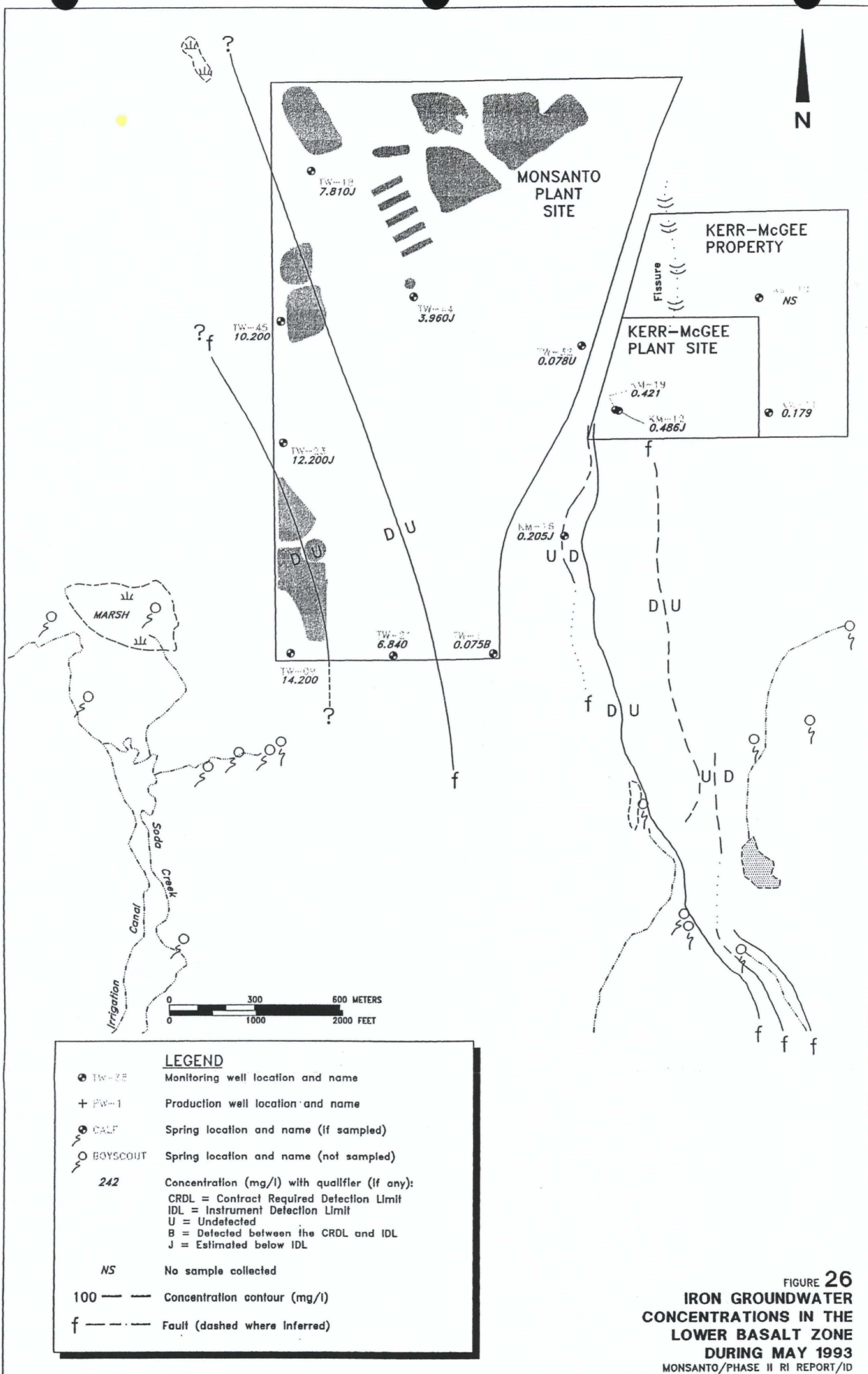
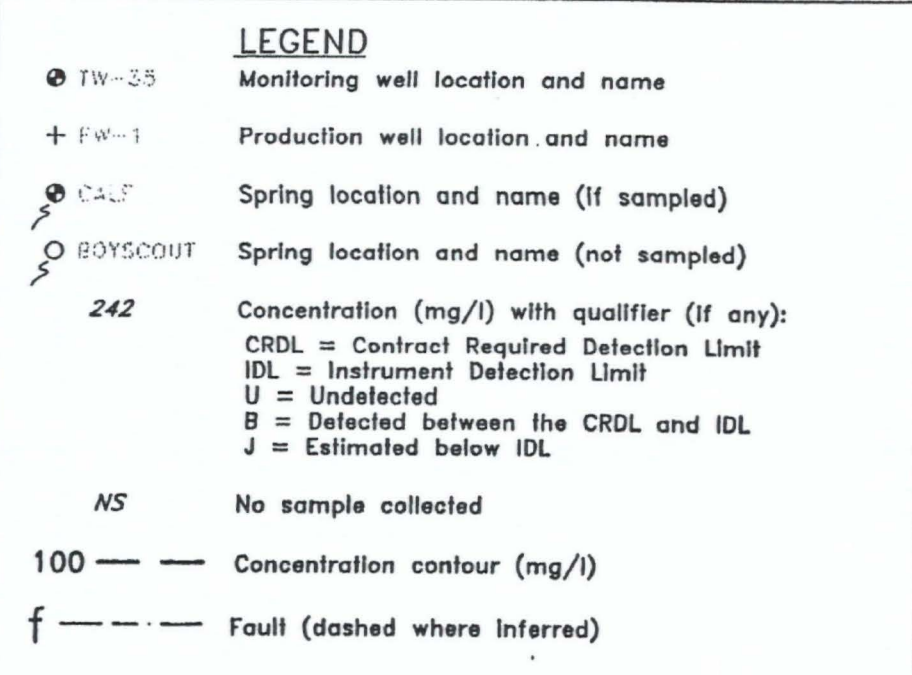


FIGURE 23  
 CADMIUM GROUNDWATER  
 CONCENTRATIONS IN THE  
 LOWER BASALT ZONE  
 DURING MAY 1993  
 MONSANTO/PHASE II RI REPORT/ID



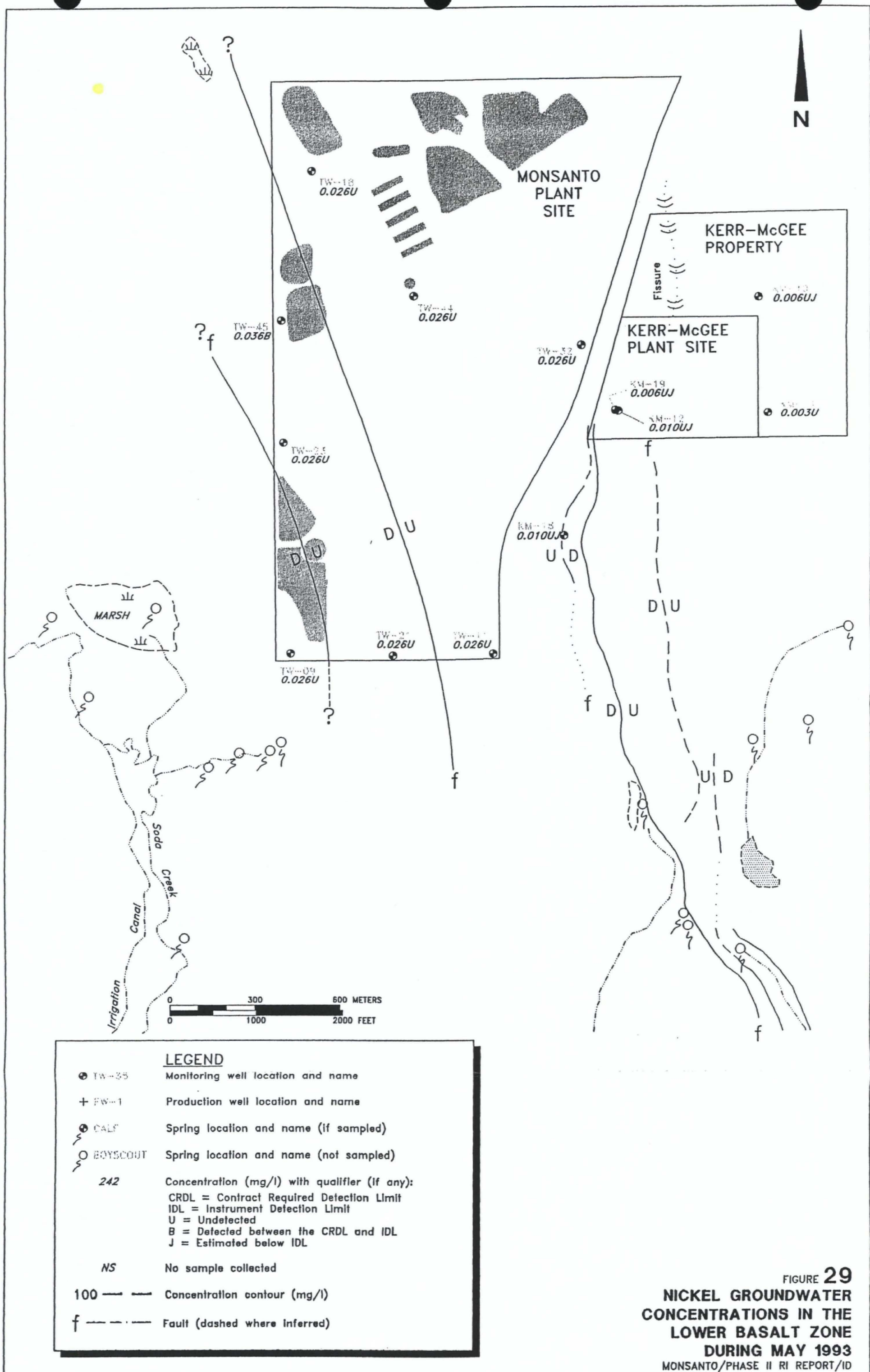






MONSANTO/PHASE II RI REPORT/ID





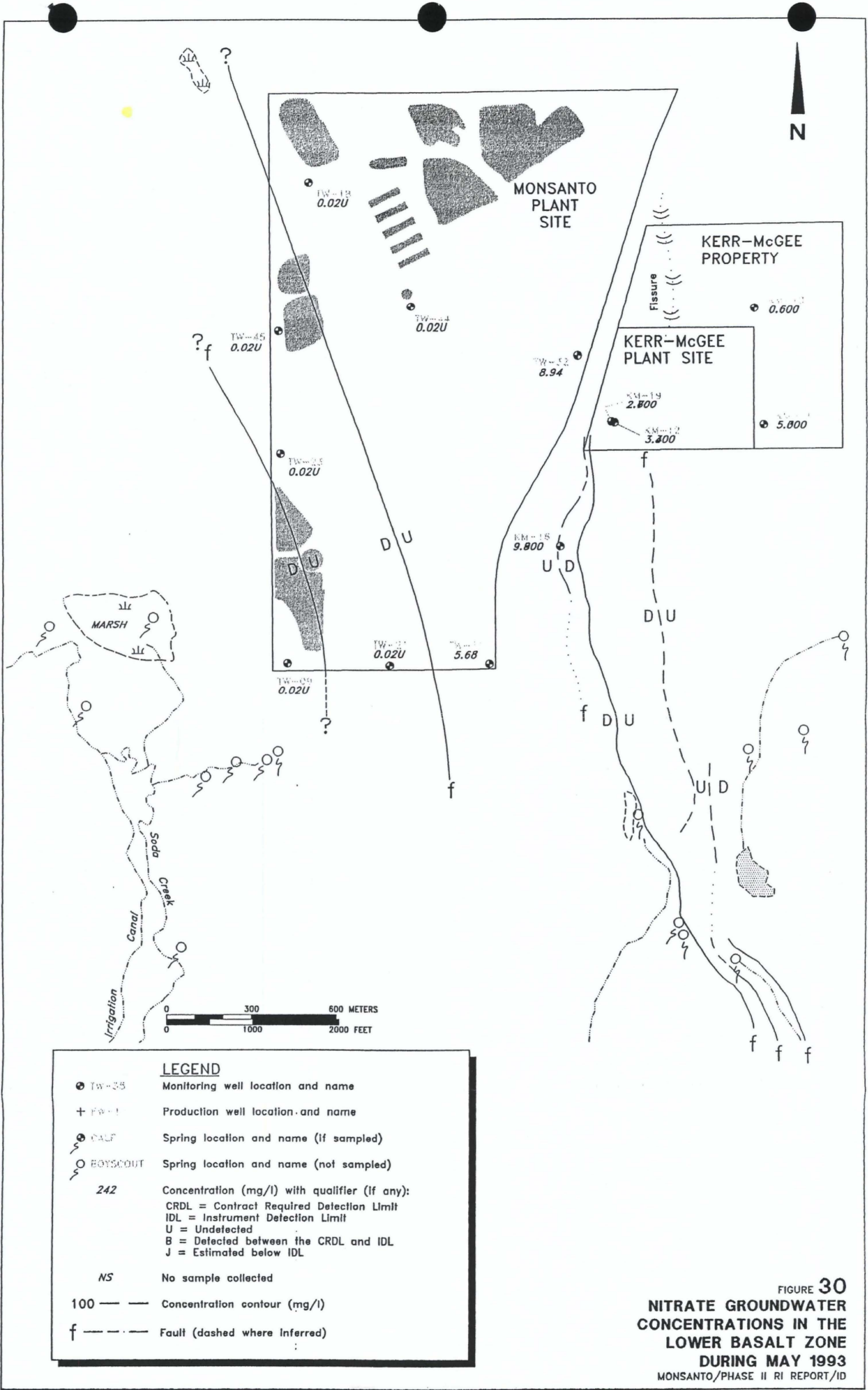


FIGURE 30  
NITRATE GROUNDWATER  
CONCENTRATIONS IN THE  
LOWER BASALT ZONE  
DURING MAY 1993  
MONSANTO/PHASE II RI REPORT/ID



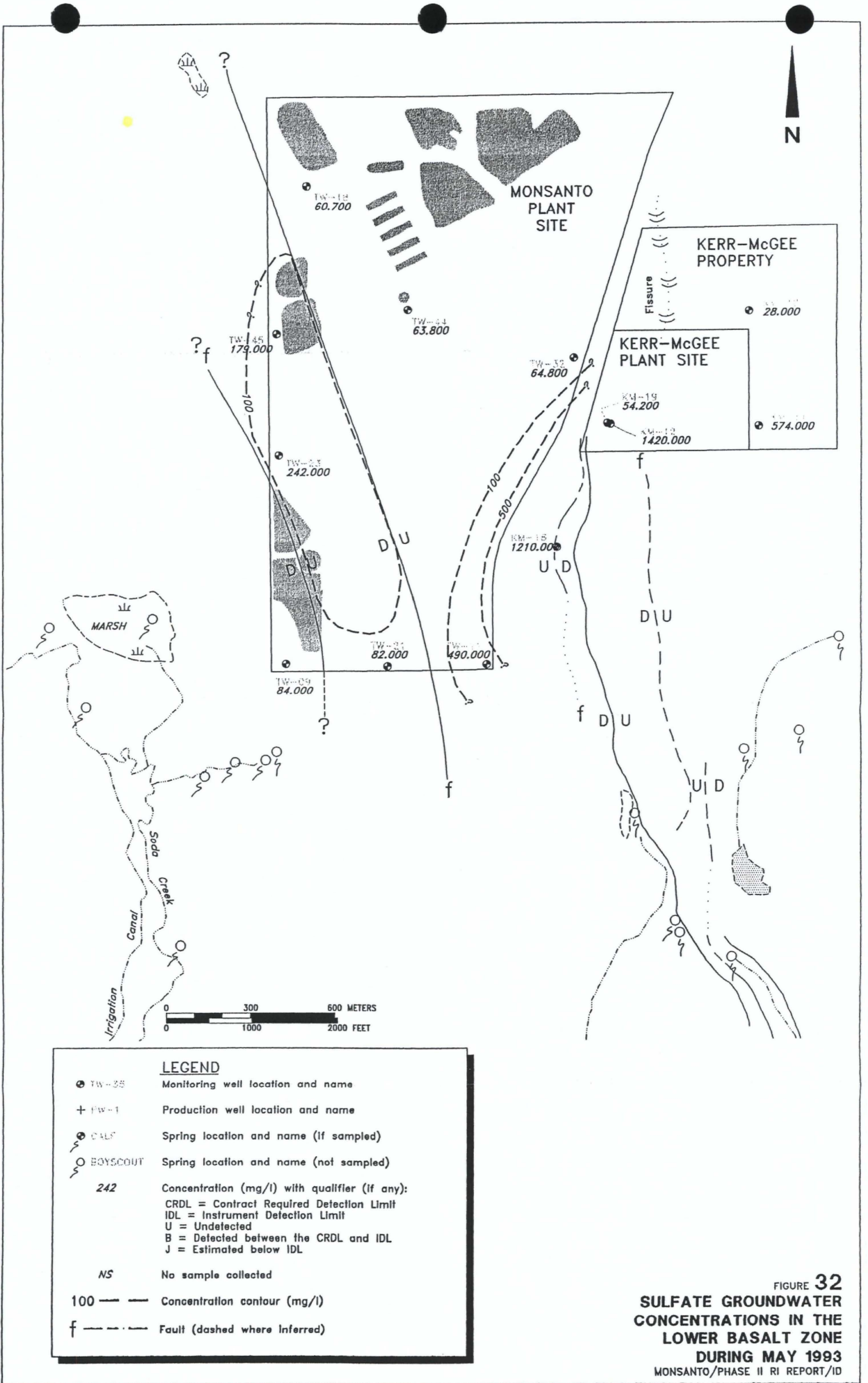
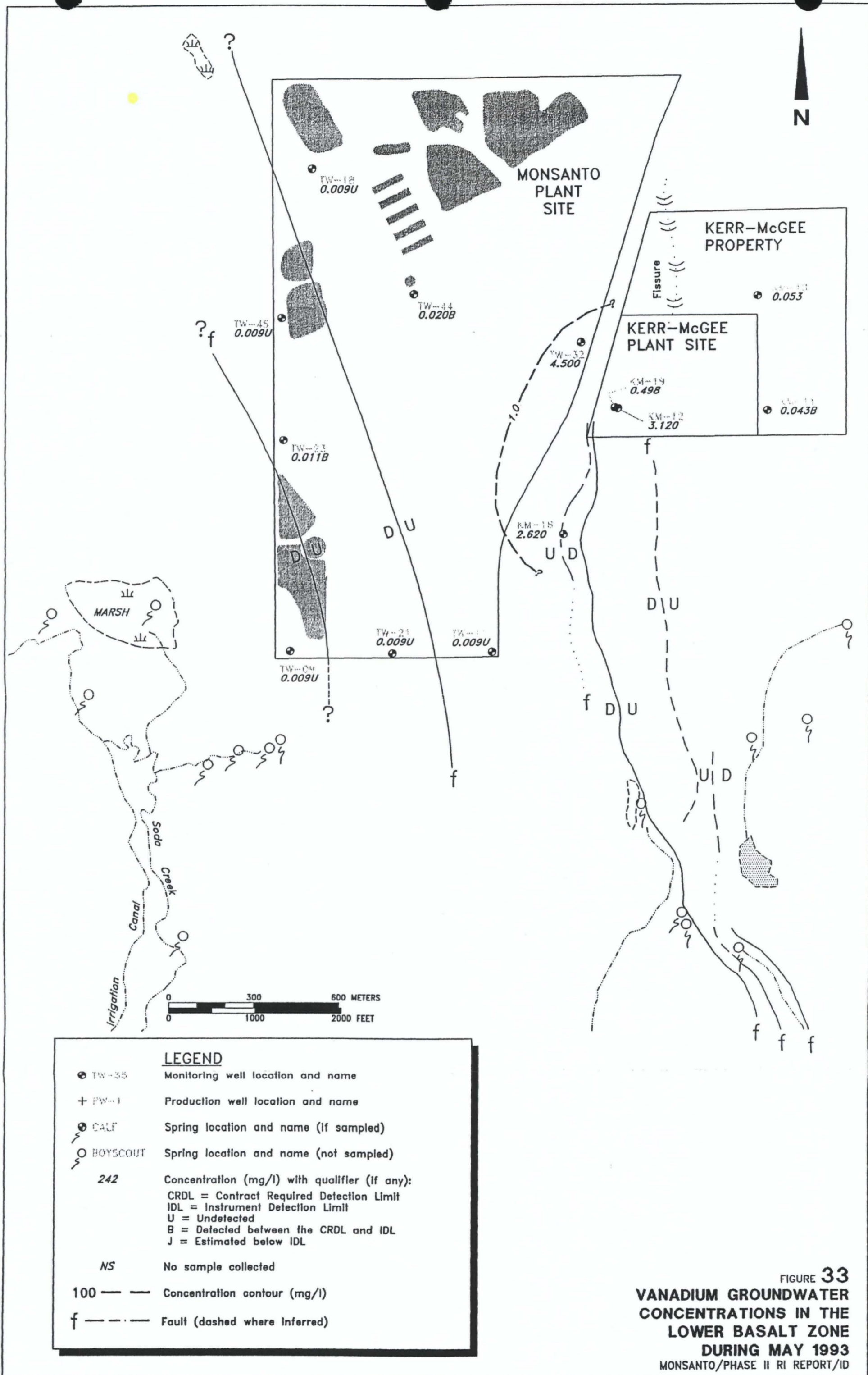


FIGURE 32  
 SULFATE GROUNDWATER  
 CONCENTRATIONS IN THE  
 LOWER BASALT ZONE  
 DURING MAY 1993  
 MONSANTO/PHASE II RI REPORT/ID



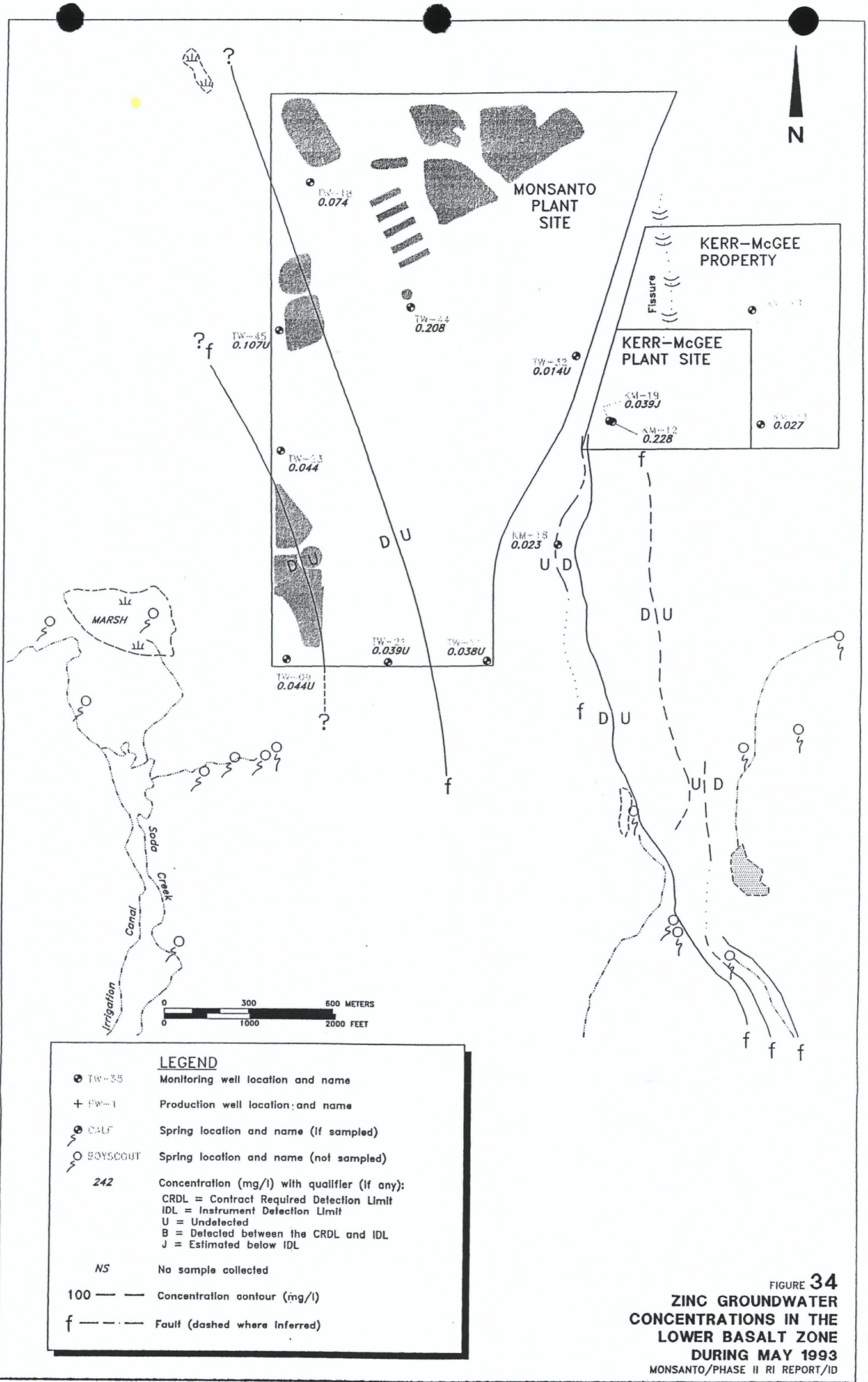
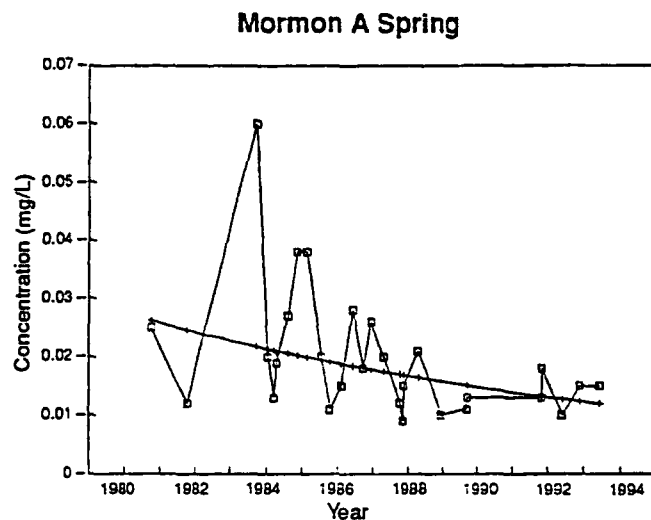
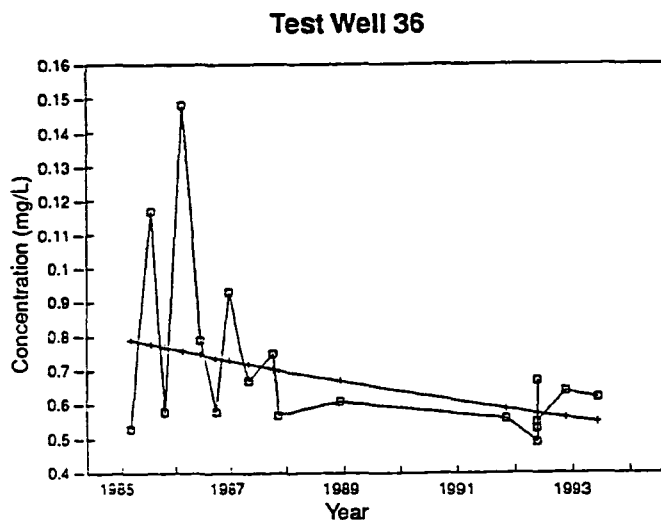
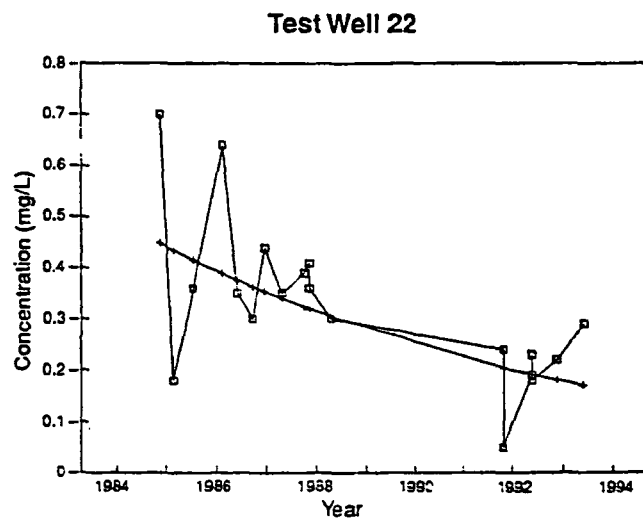
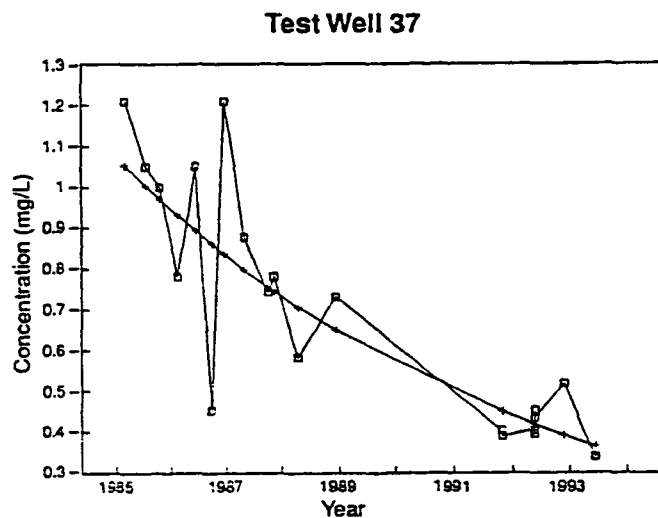
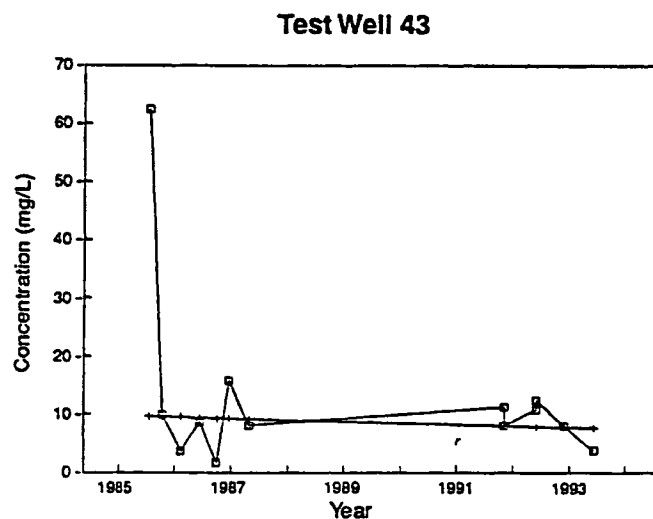
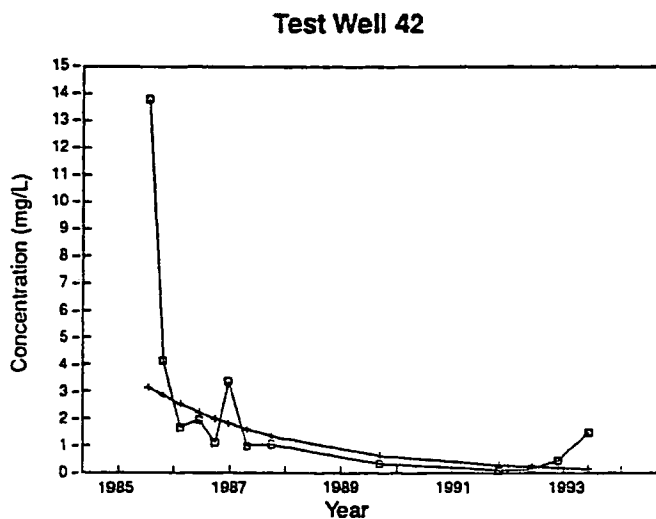
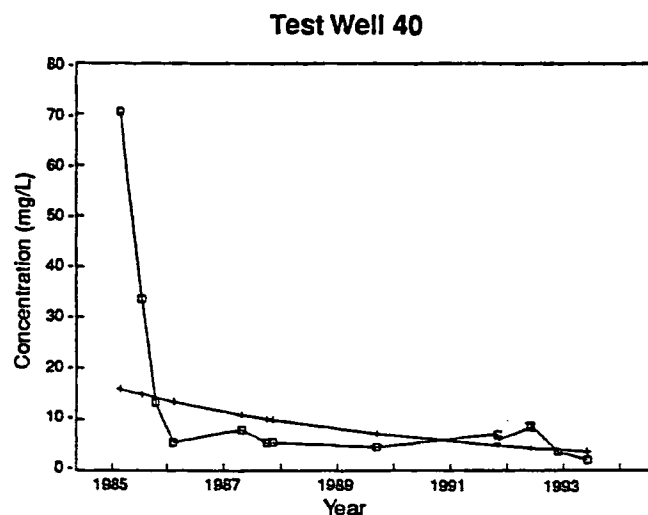
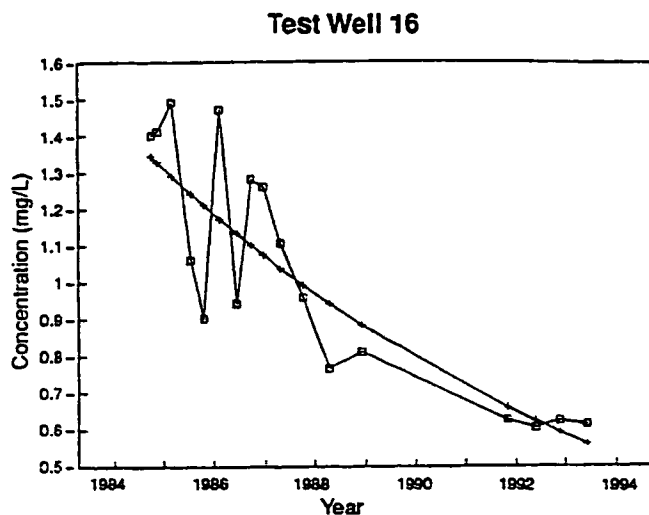


FIGURE 34  
 ZINC GROUNDWATER  
 CONCENTRATIONS IN THE  
 LOWER BASALT ZONE  
 DURING MAY 1993  
 MONSANTO/PHASE II RI REPORT/ID



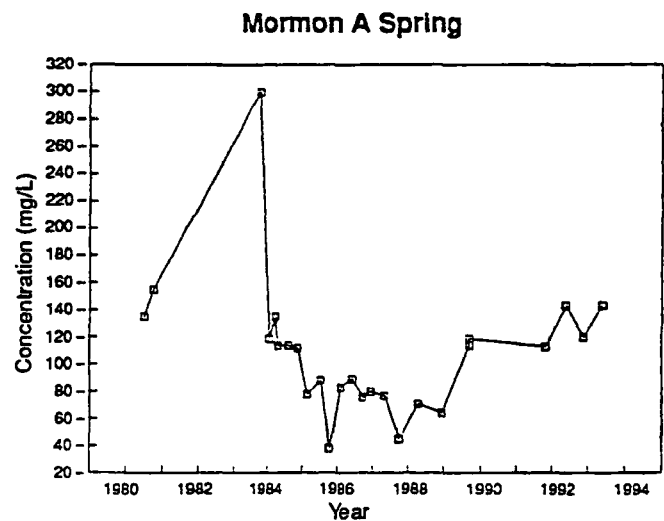
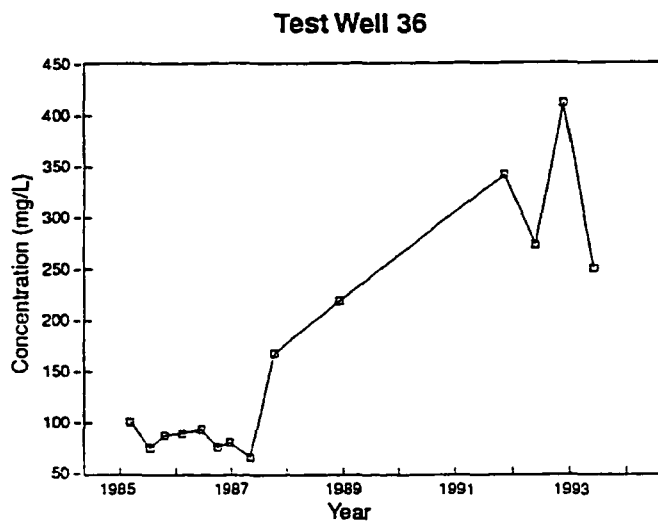
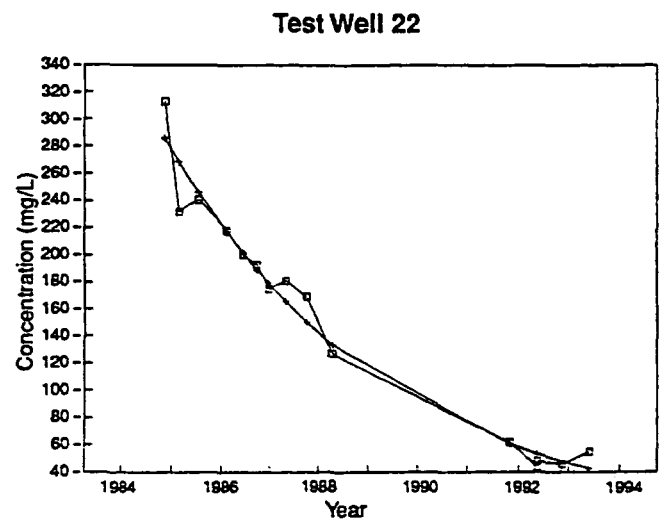
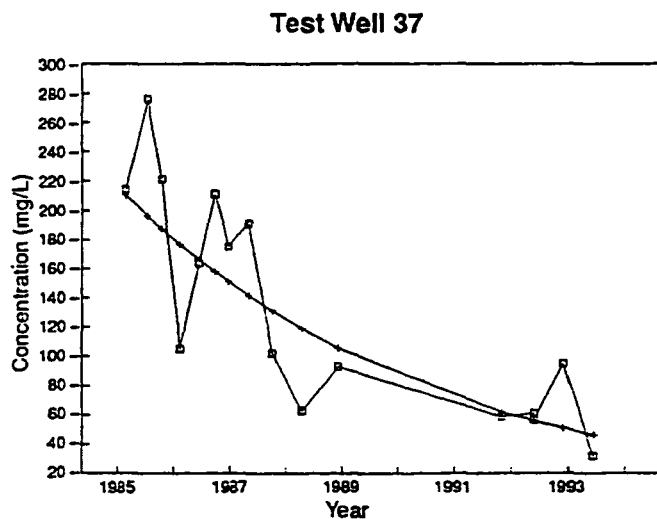
Sample Analysis  
 Regression Curve

FIGURE 35  
 CADMIUM GROUNDWATER CONCENTRATION  
 OLD UNDERFLOW SOLIDS PONDS AREA  
 MONSANTO/PHASE II REPORT/ID



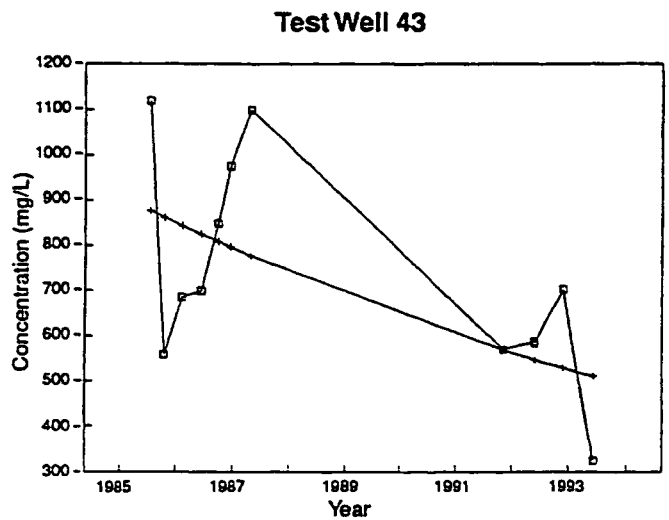
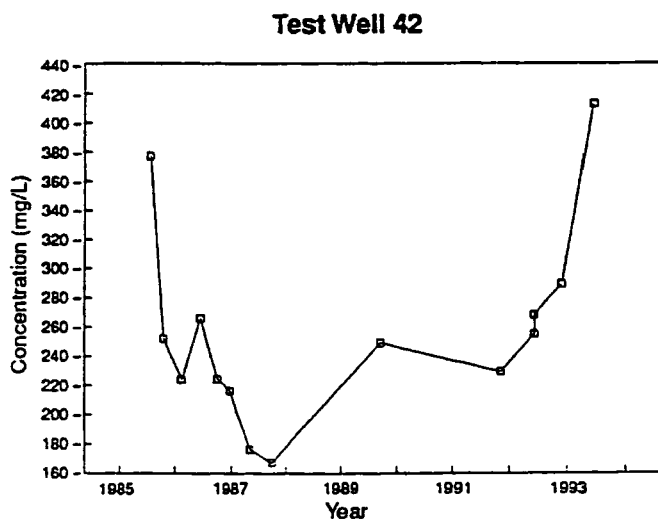
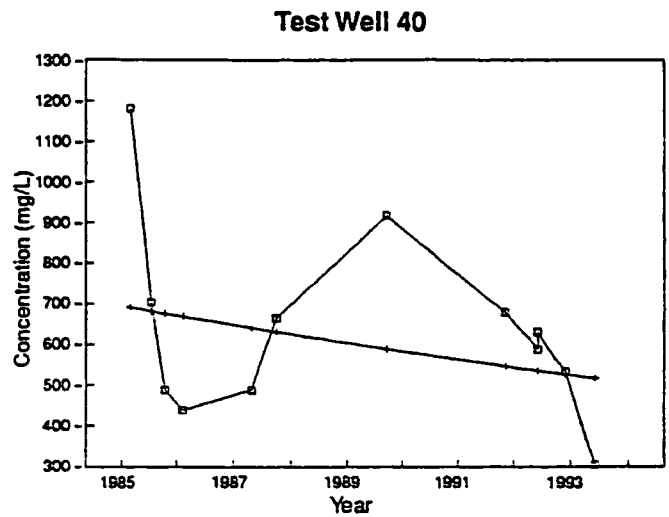
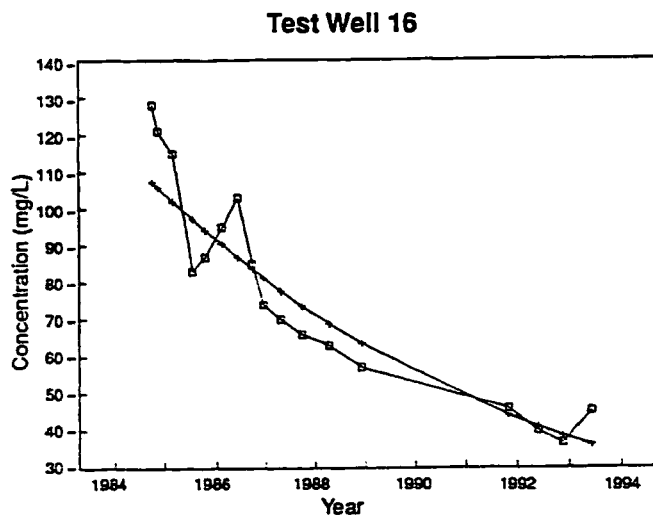
Sample Analysis  
 Regression Curve

FIGURE 36  
 CADMIUM GROUNDWATER CONCENTRATION  
 NORTHWEST POND/HYDROCLARIFIER AREA  
 MONSANTO/PHASE II REPORT/ID



Sample Analysis  
 Regression Curve

FIGURE 37  
 CHLORIDE GROUNDWATER CONCENTRATION  
 OLD UNDERFLOW SOLIDS PONDS AREA  
 HUNTER/EAGLES RIDGE/WA



□—□—□ Sample Analysis  
 +—+—+ Regression Curve

FIGURE 38  
 CHLORIDE GROUNDWATER CONCENTRATION  
 NORTHWEST POND/HYDROCLARIFIER AREA  
 MONSANTO/PHASE II REPORT/ID

APPENDIX A  
TIME HISTORY PLOTS OF GROUNDWATER CONCENTRATION

## A.1 EXPLANATION

This appendix contains time history plots of groundwater concentration for selected constituents and at selected well locations. The plots are arranged alphabetically and include the following constituents:

- Aluminum,
- Arsenic,
- Fluoride,
- Iron,
- Manganese,
- Molybdenum,
- Nickel,
- Nitrate,
- Sulfate,
- Vanadium, and
- Zinc

These constituents include the constituents of potential interest identified in Section 2.3, with the exception of cadmium, chloride, and selenium. Cadmium and chloride time history plots are shown on Figures 35 through 38. Selenium time history data is limited to only recent sampling and is not shown, however, the current selenium concentrations observed in groundwater are shown on Figures 17 and 31.

The selected test well locations are within the areas of the old underflow solids ponds plume and the northwest pond/hydroclarifier plume. Figure 3 shows the locations of test wells. No plots are shown for test wells sampling the Lower Basalt Zone.

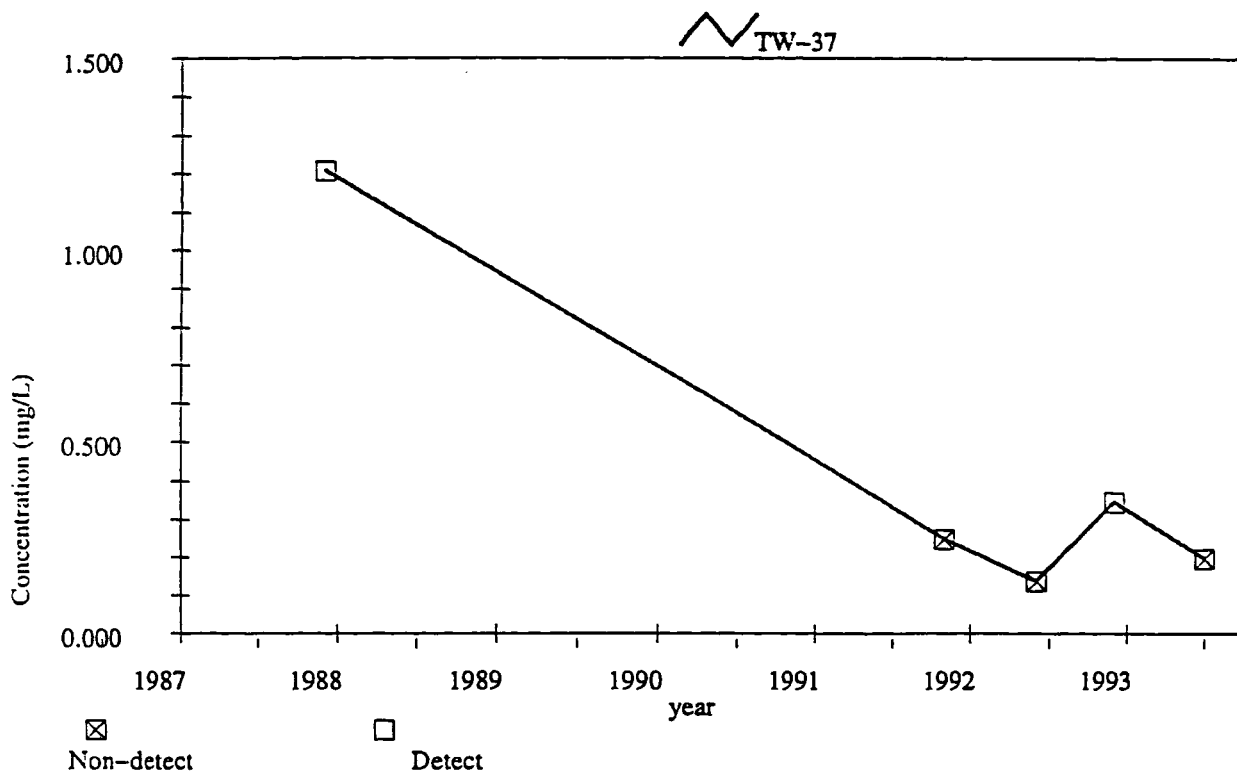


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/I/D

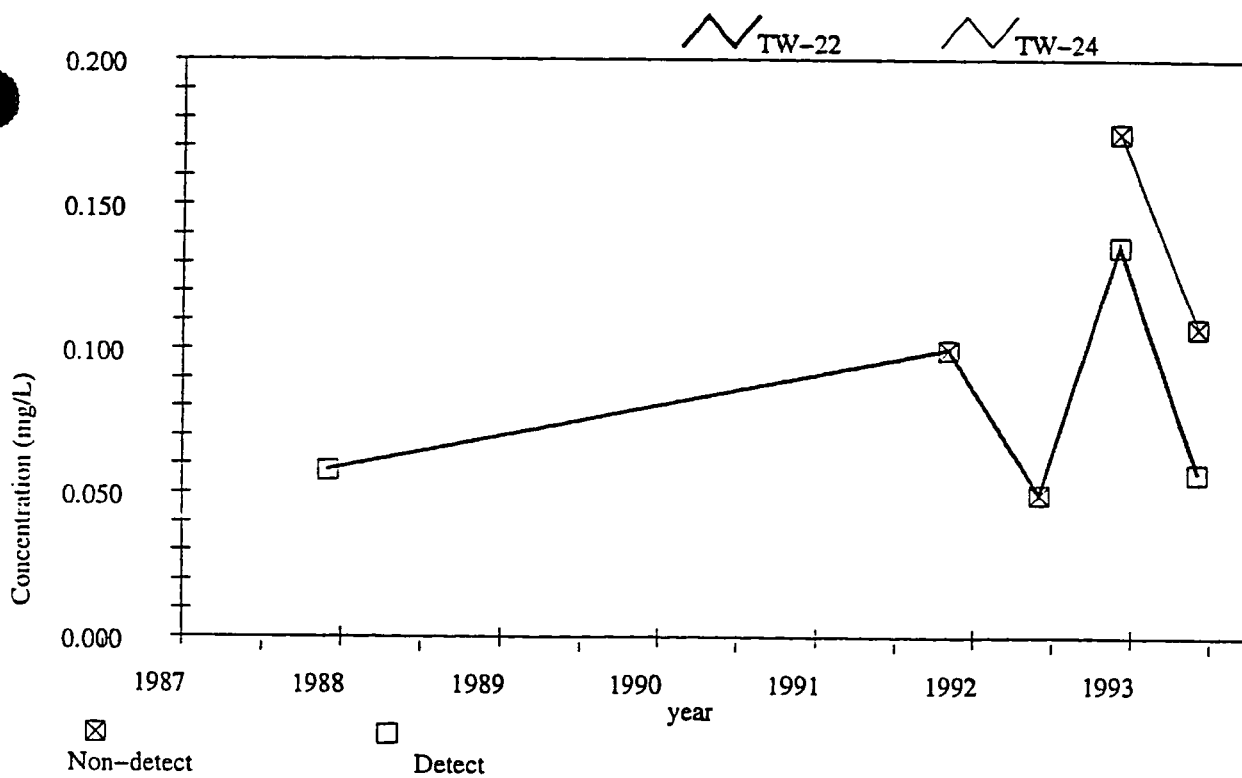


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

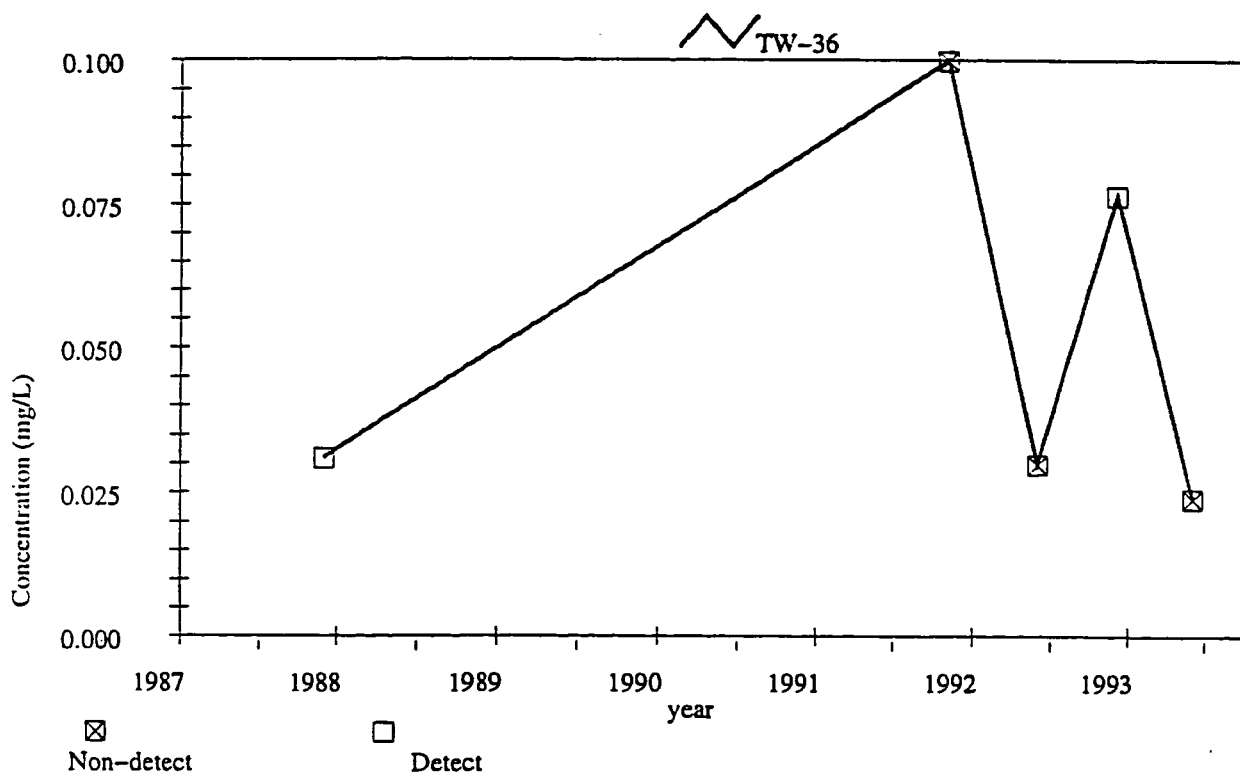


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

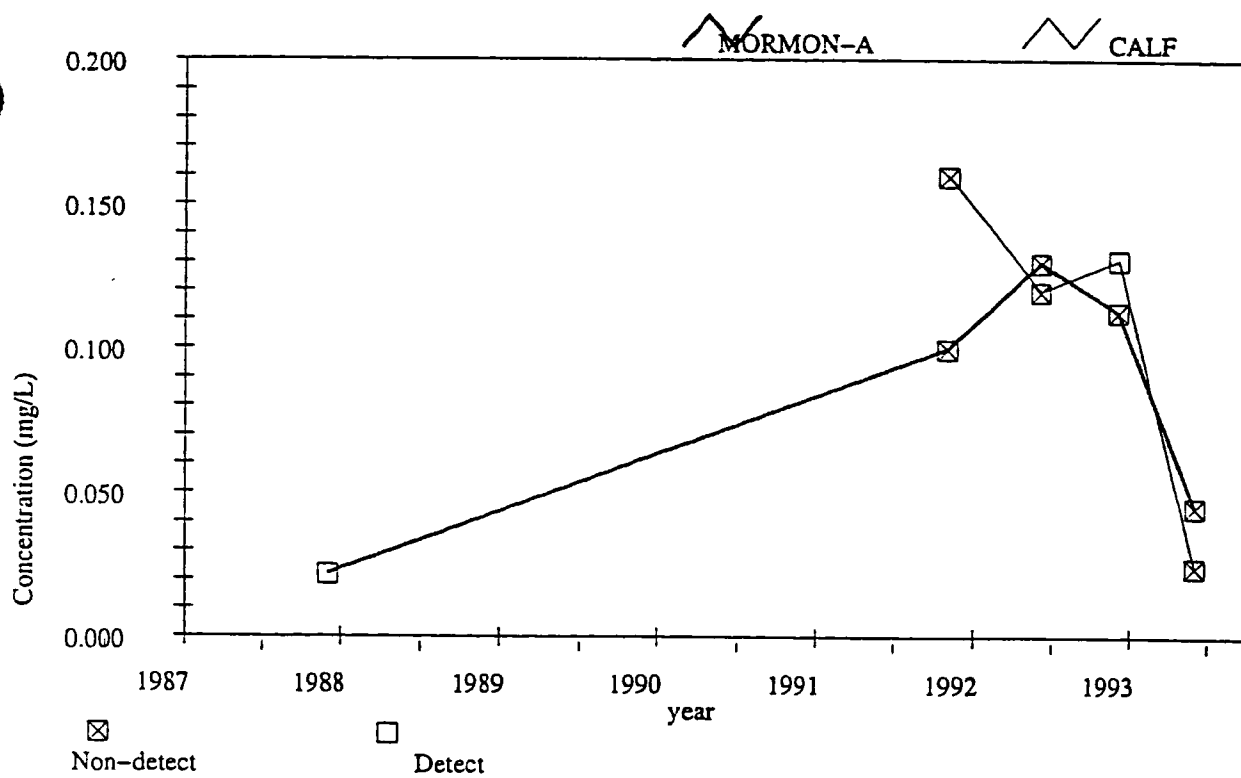


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

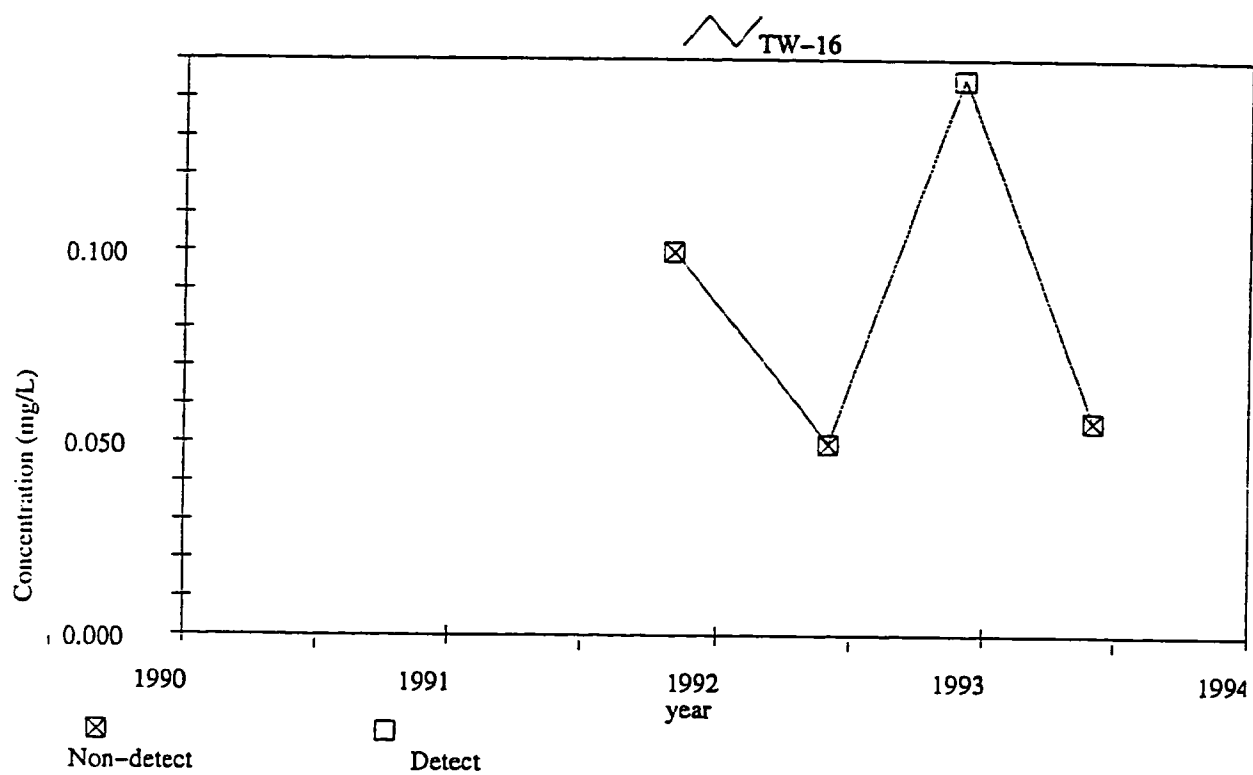


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II RI/ID

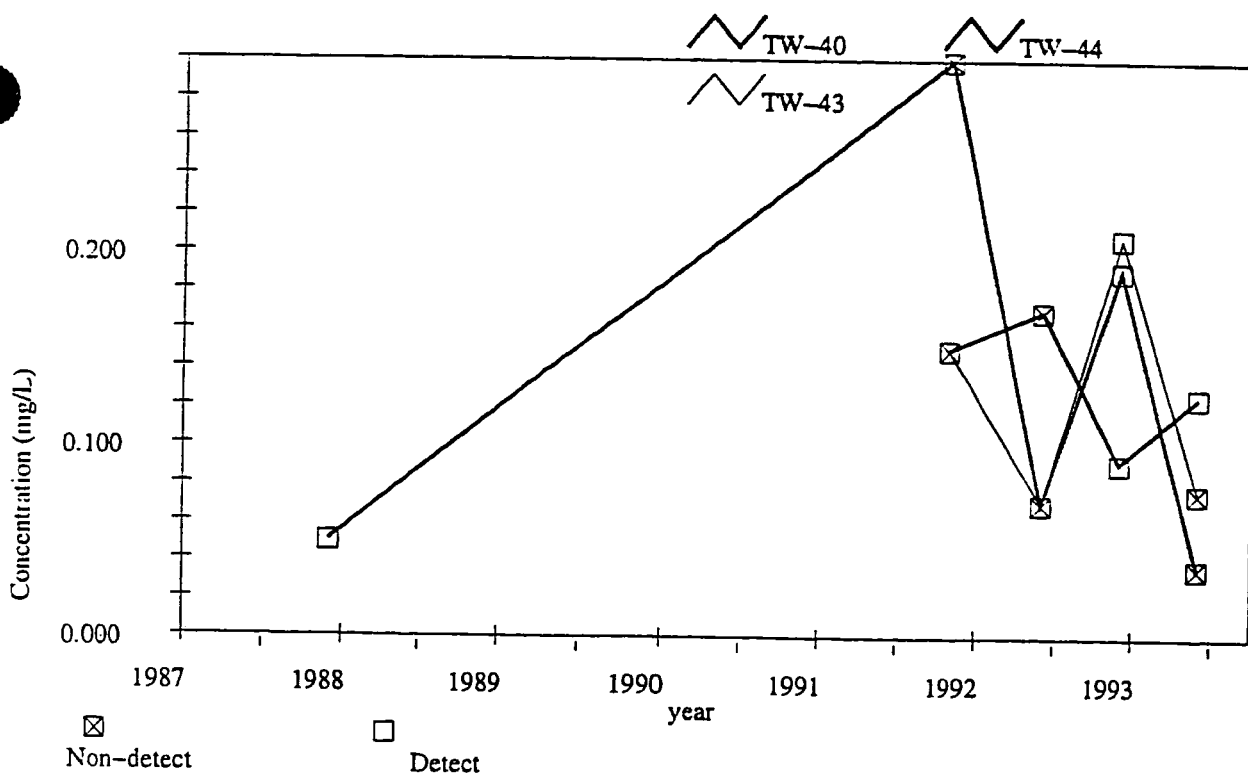


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II R/I/D

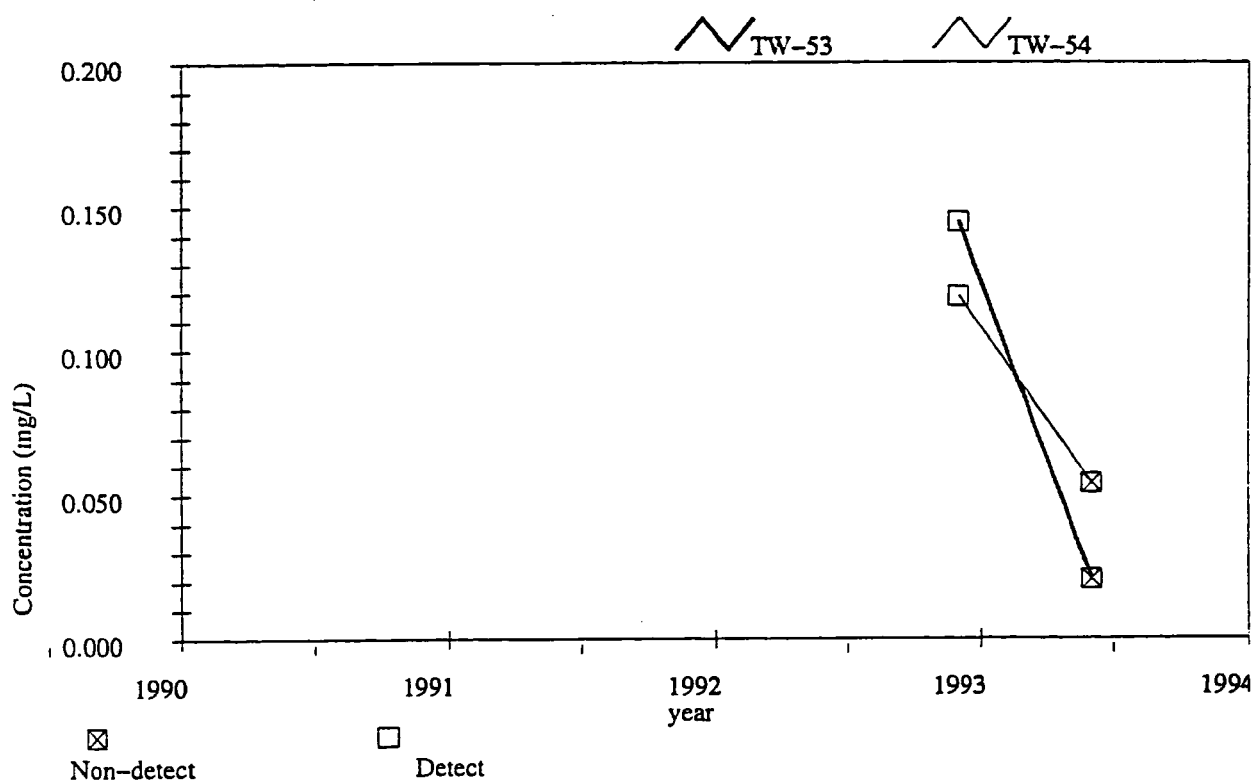


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

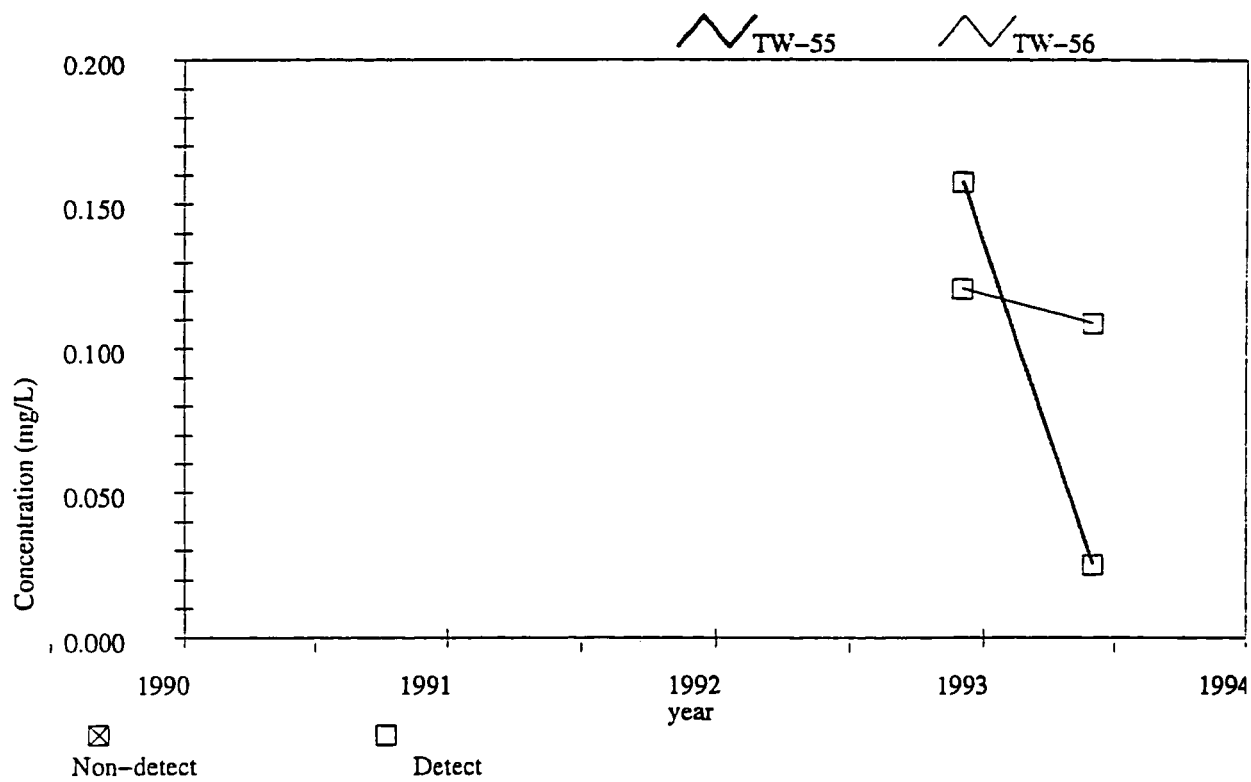


FIGURE  
Aluminum CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

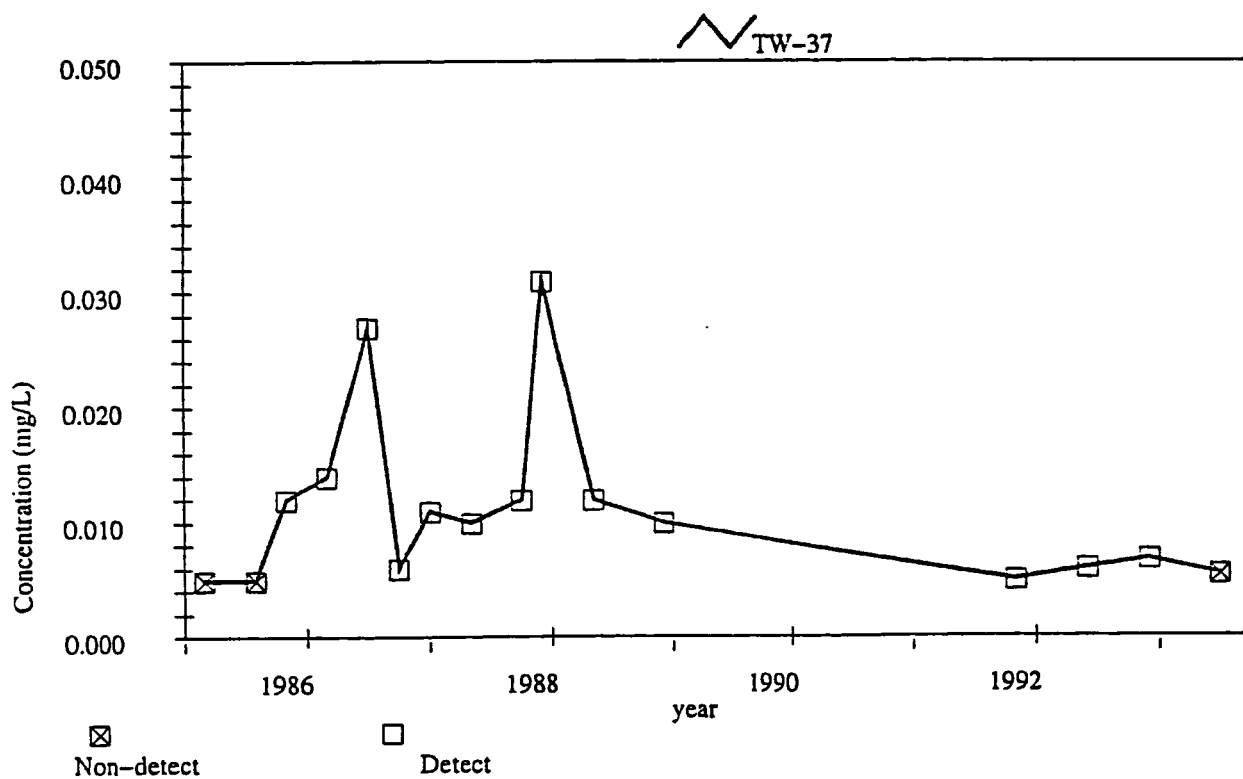


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II RI/ID

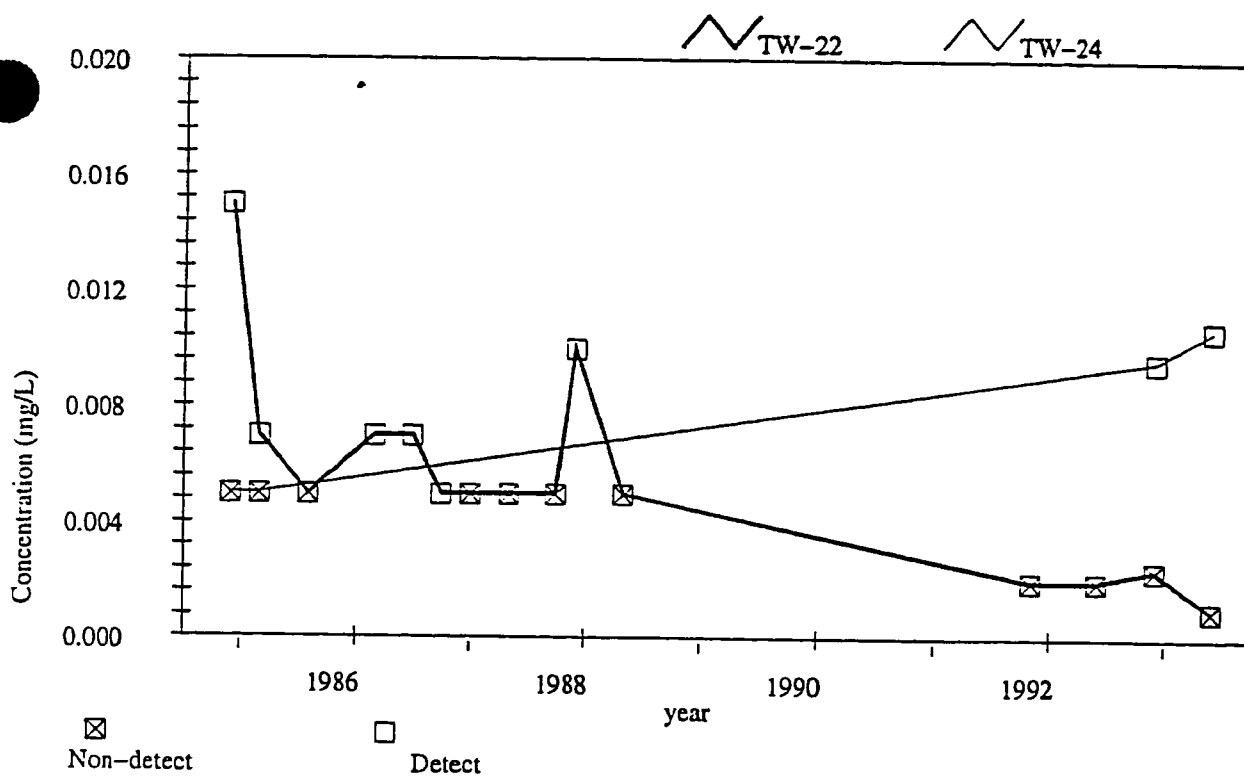


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II RI/ID

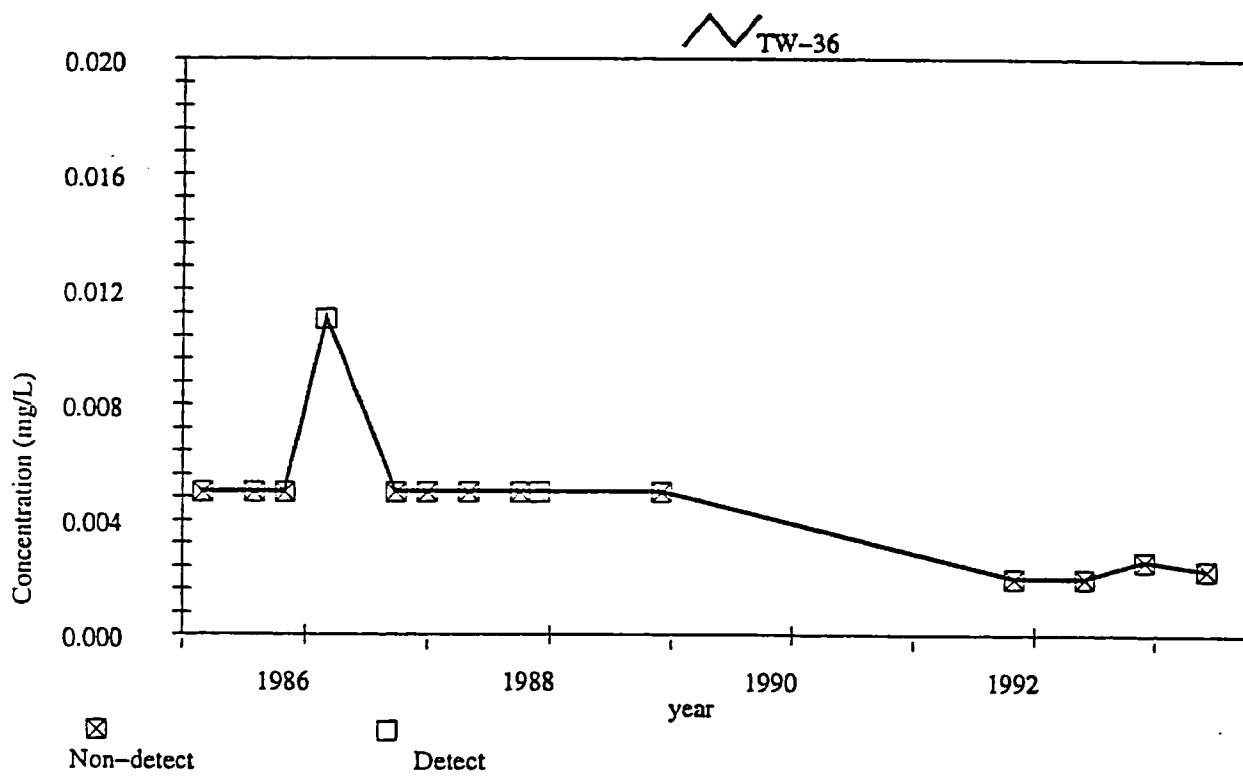


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

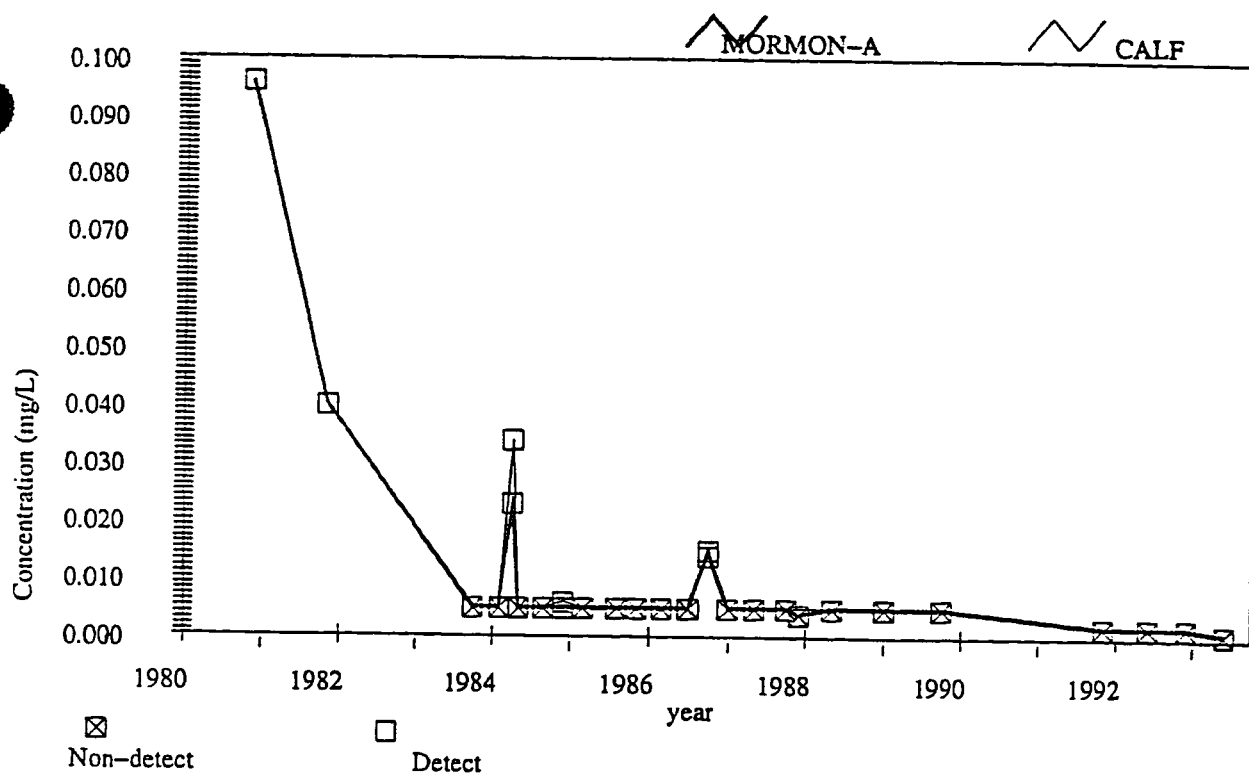


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

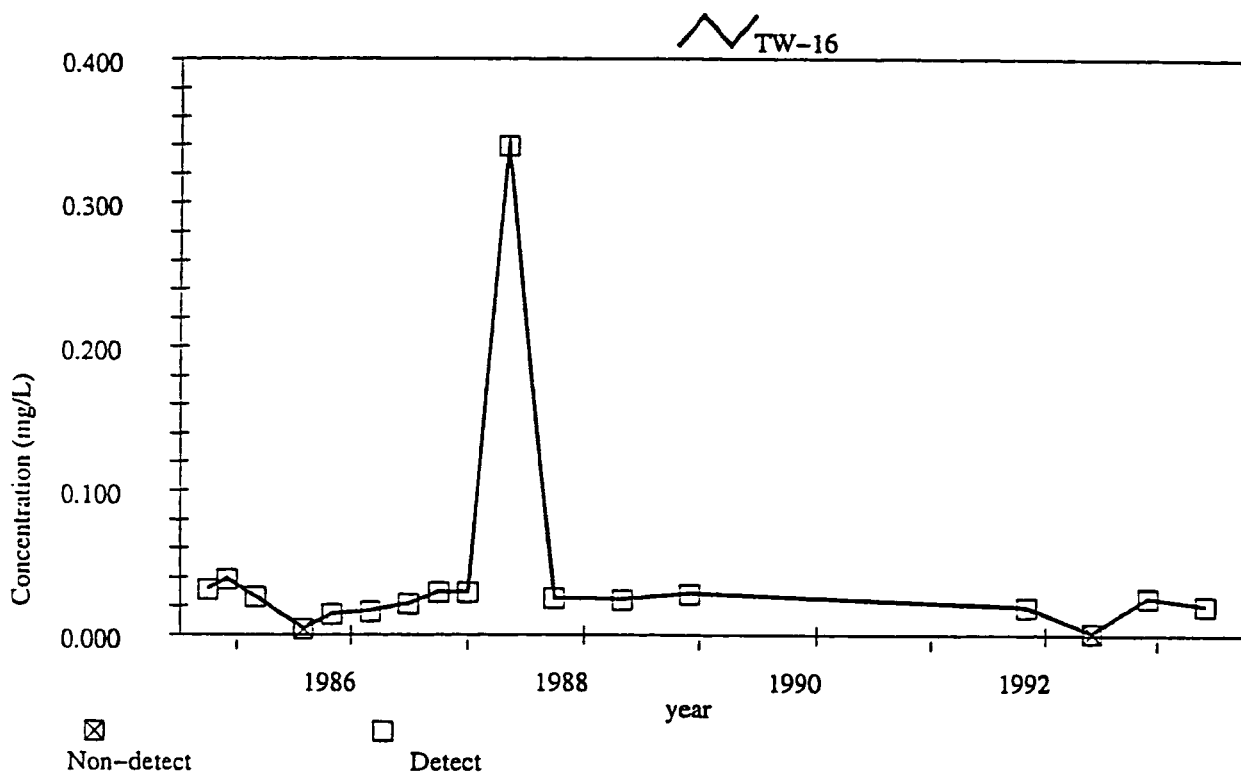


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID

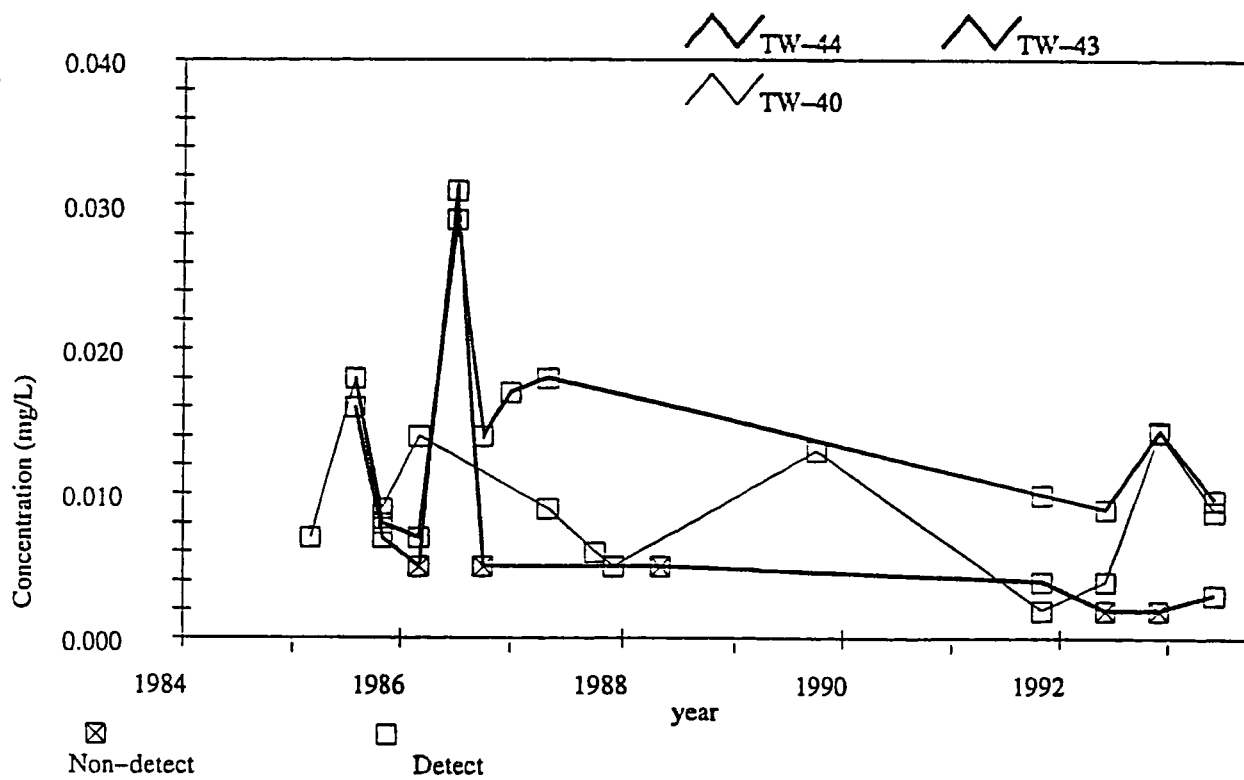


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-44  
MONSANTO/PHASE II R/ID

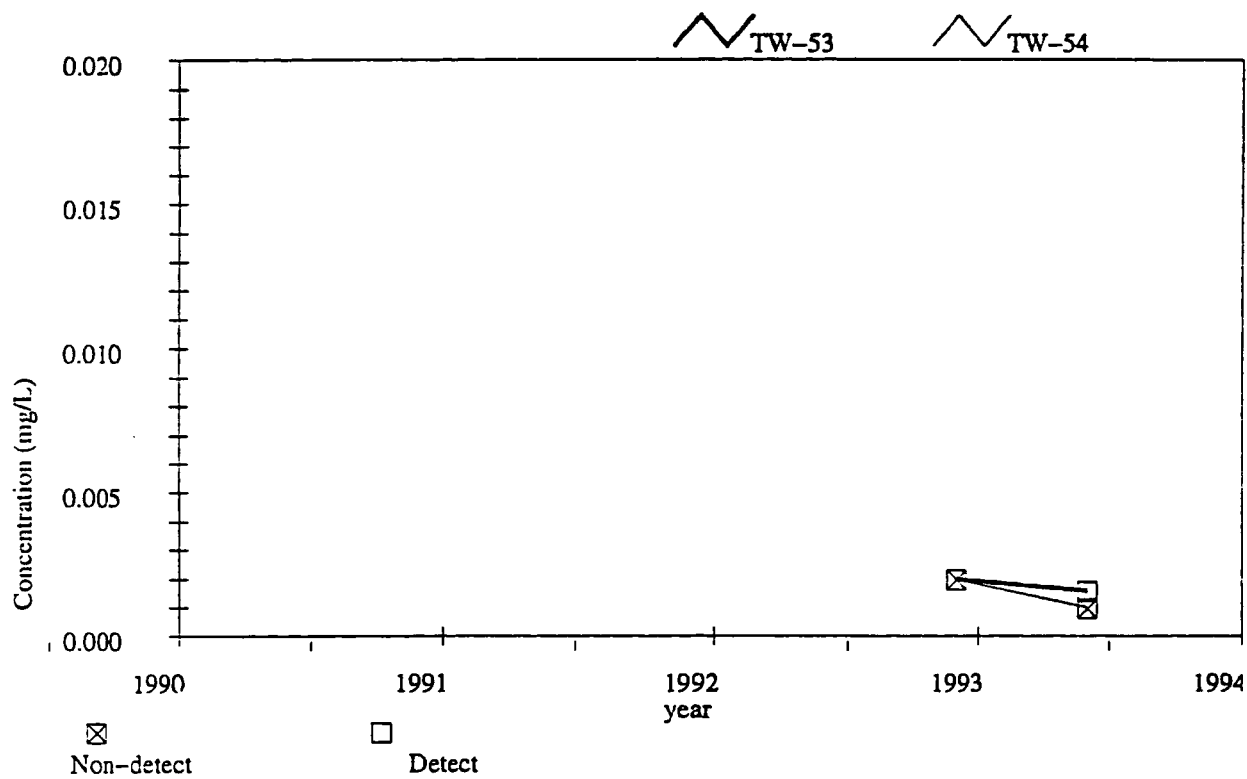


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

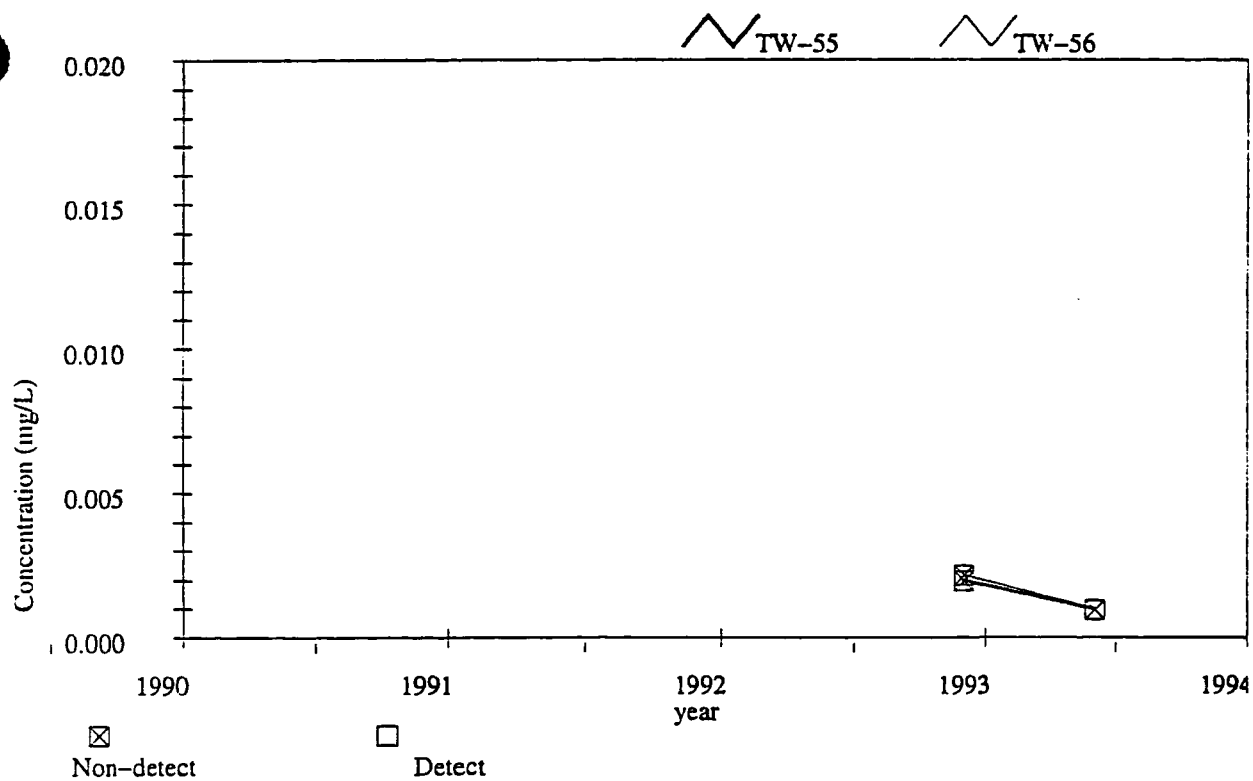


FIGURE  
Arsenic CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II RI/ID

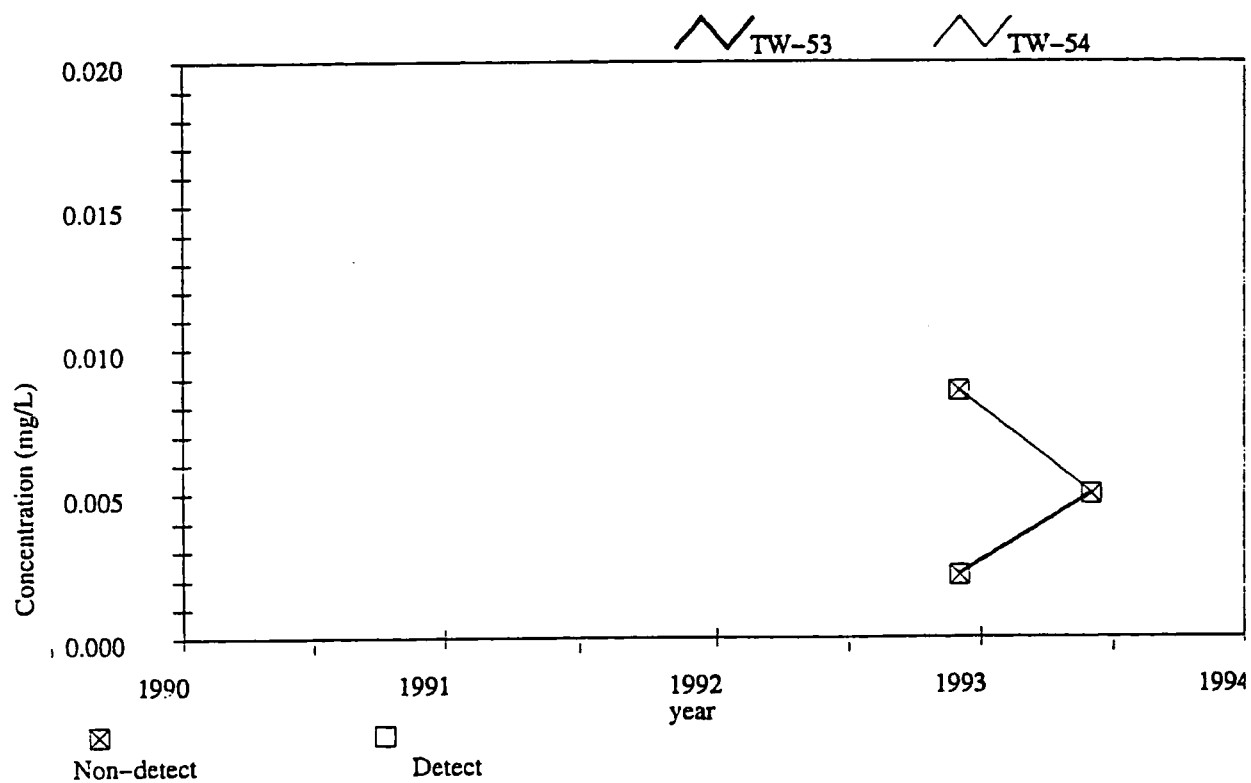


FIGURE  
Cadmium CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

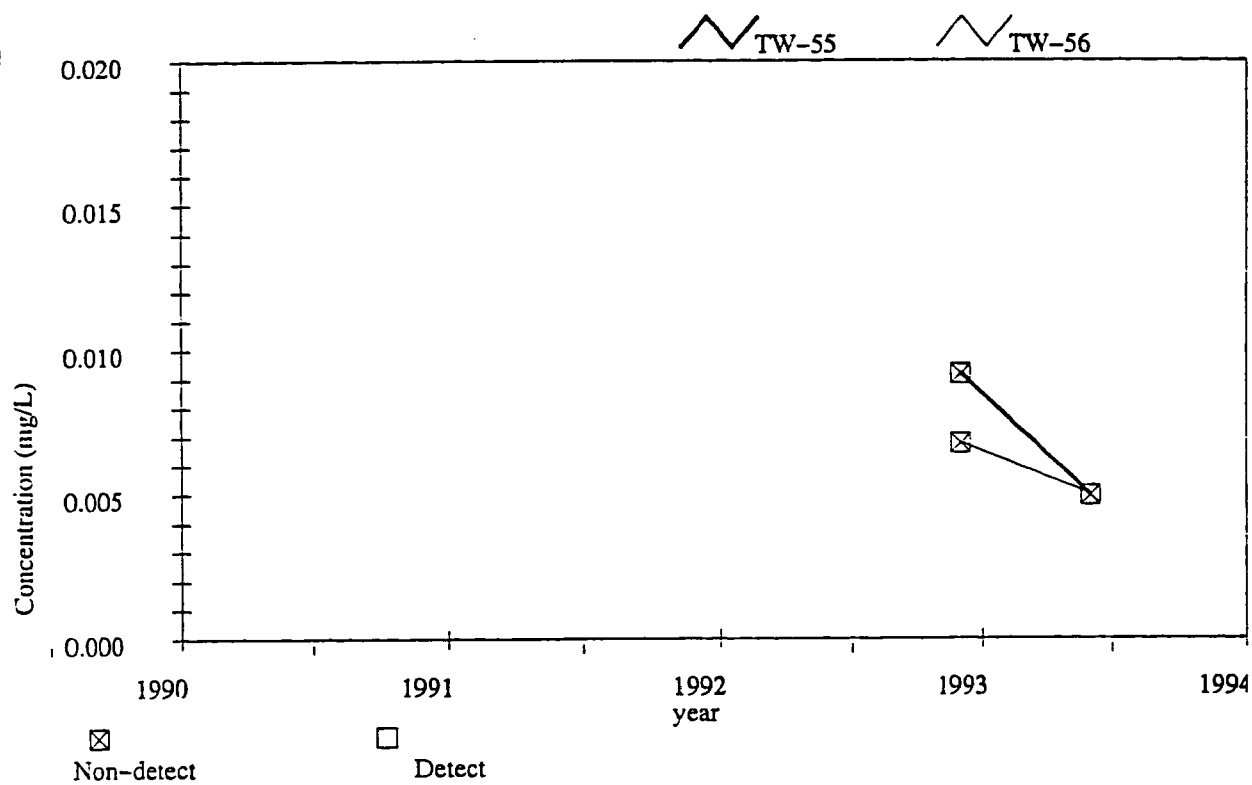


FIGURE  
Cadmium CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

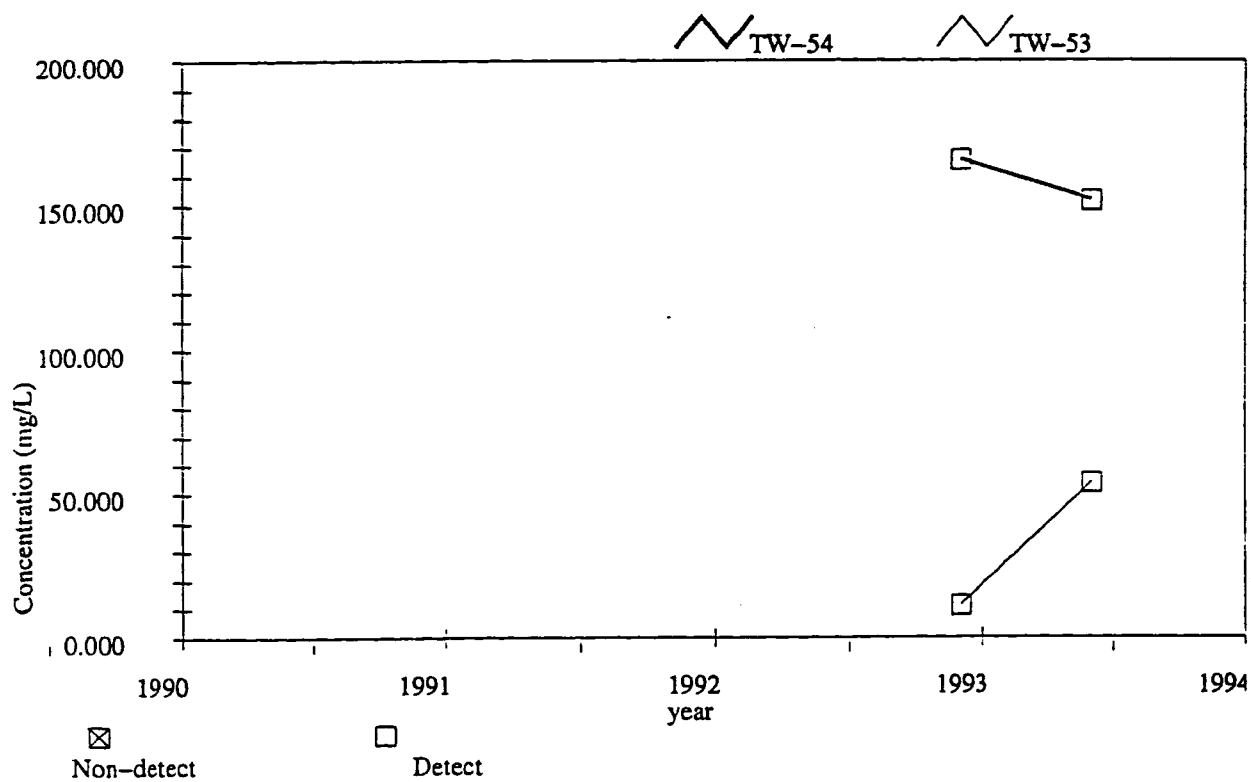


FIGURE  
Chloride CONCENTRATION TIME HISTORY  
FOR TW-54  
MONSANTO/PHASE II R/ID

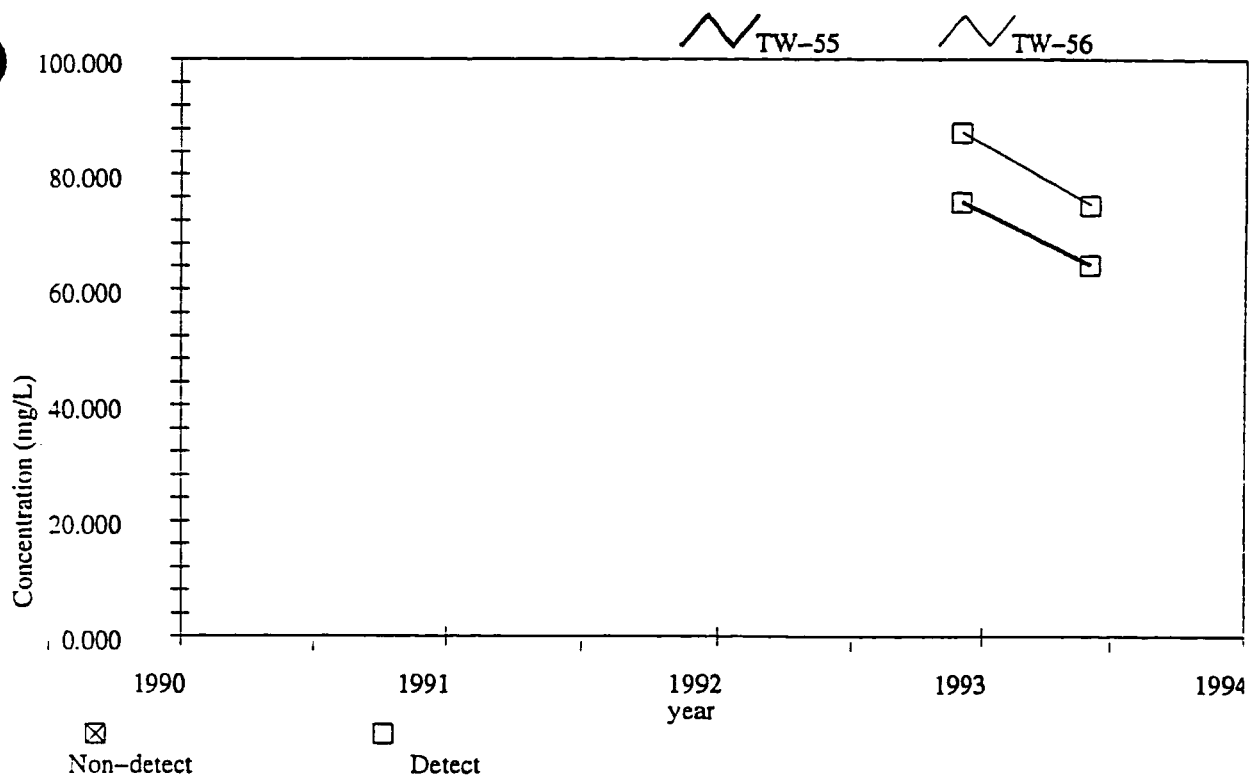


FIGURE  
Chloride CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

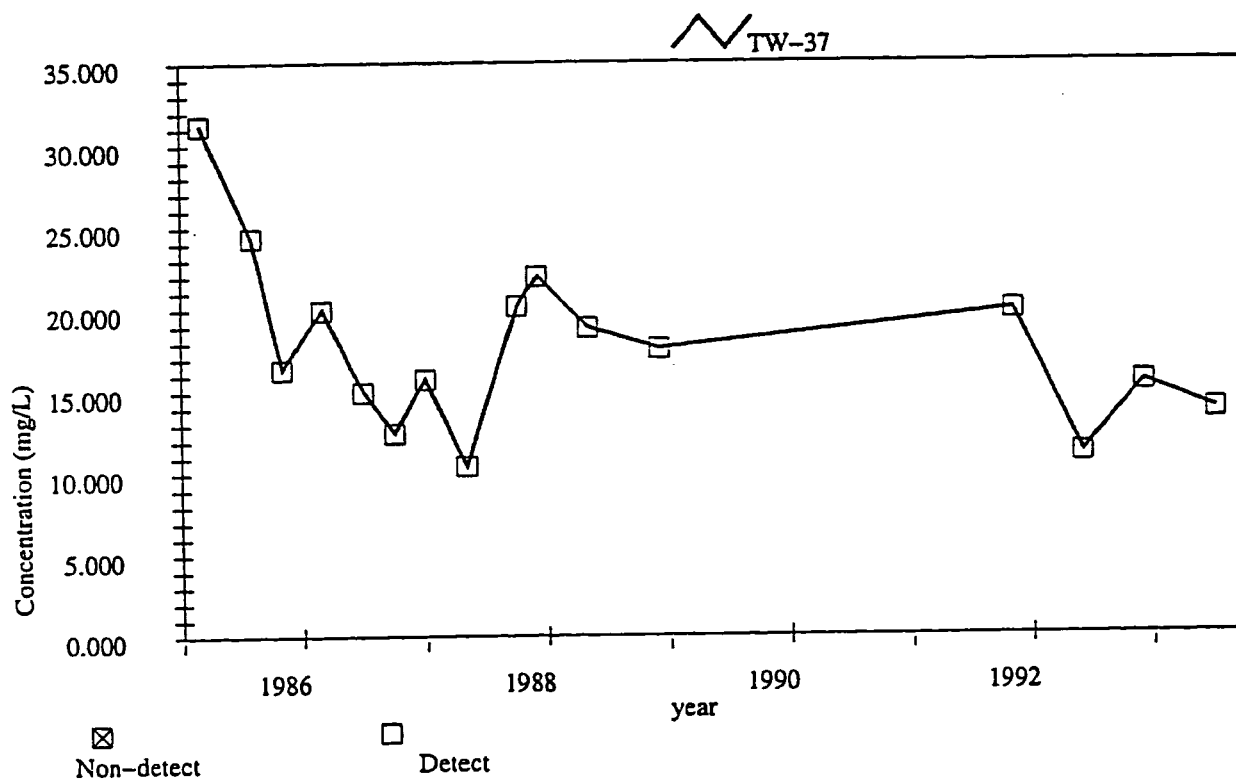


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

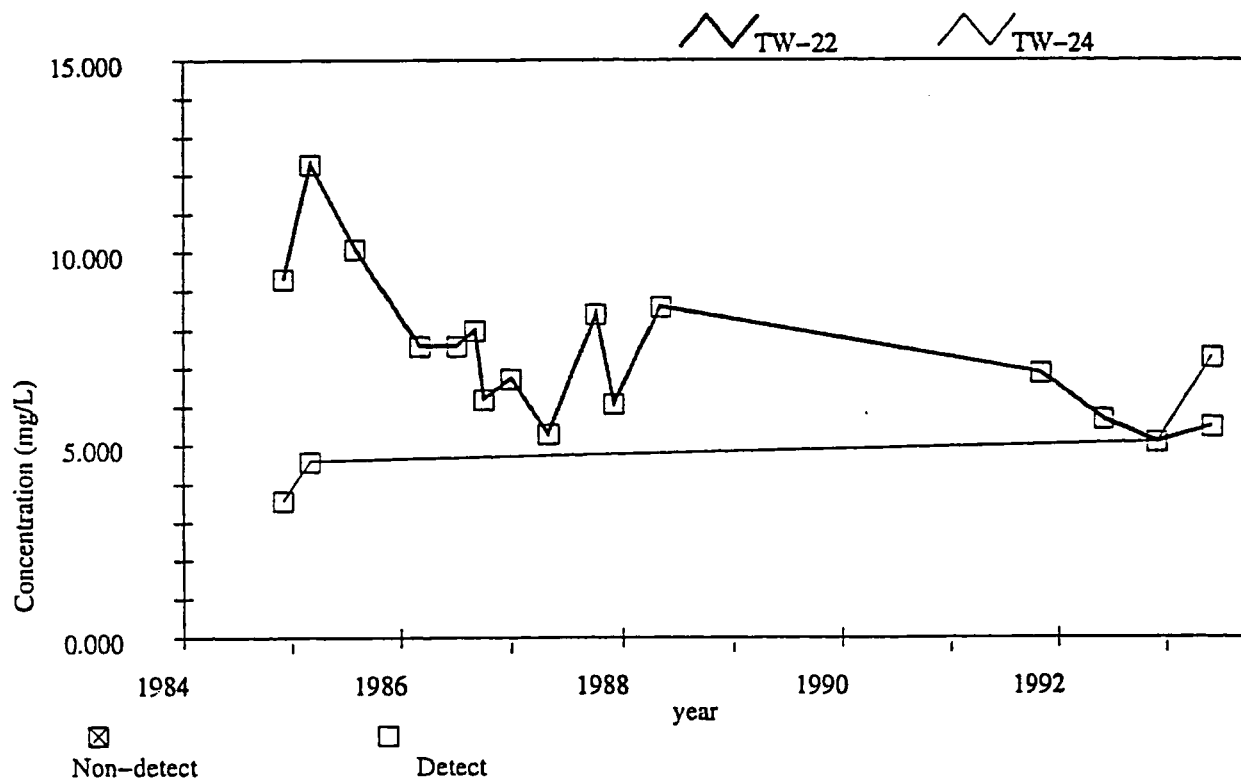


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

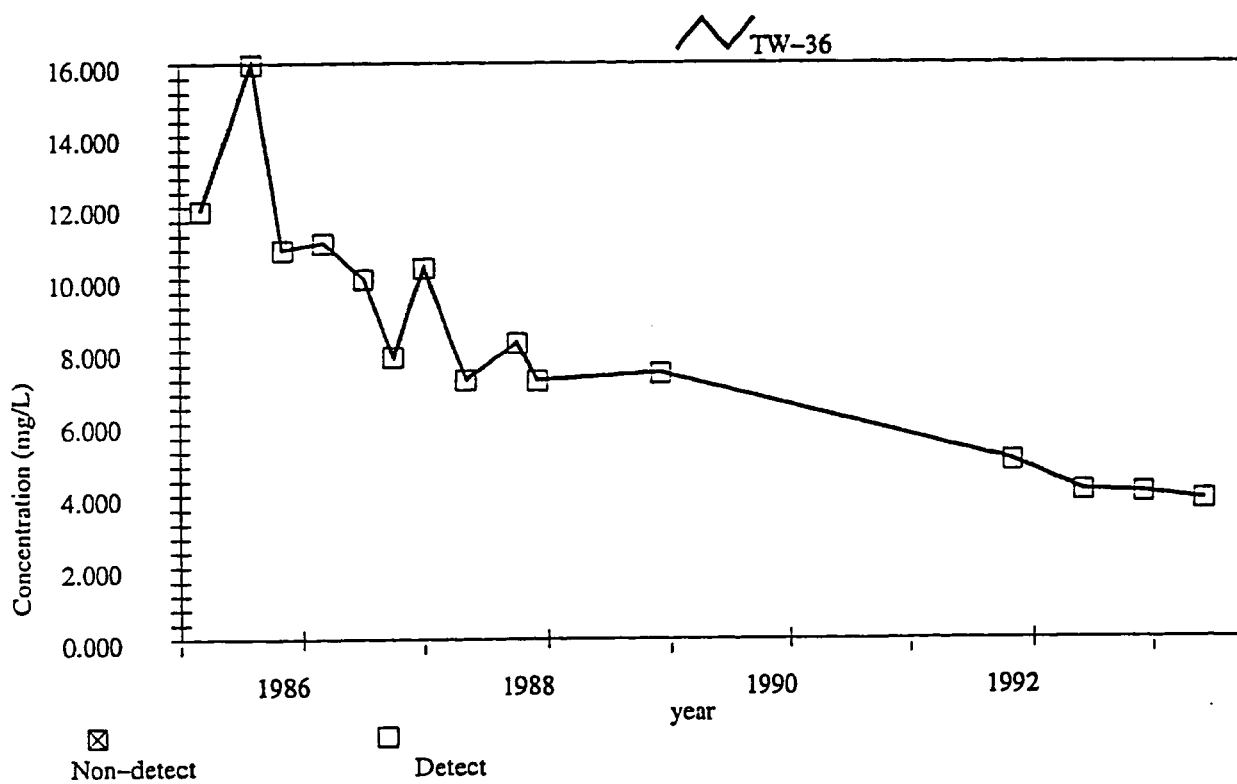


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

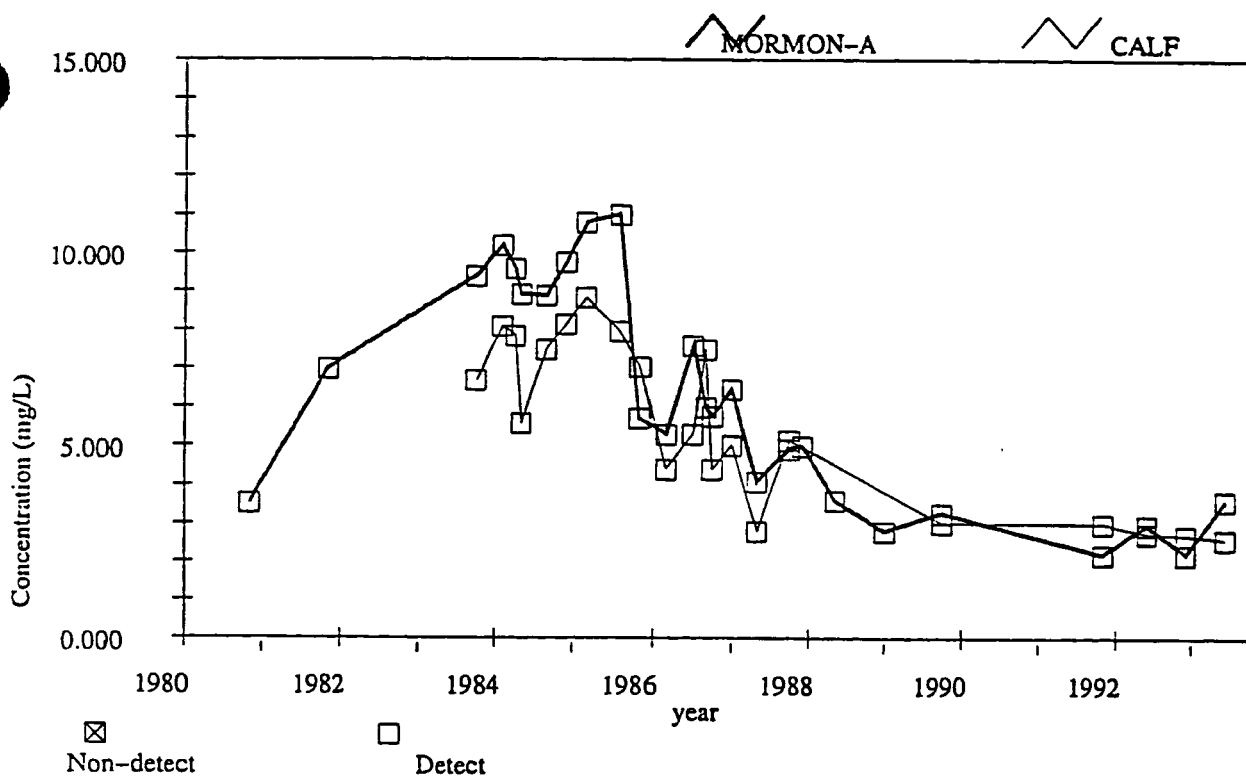


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/I/D

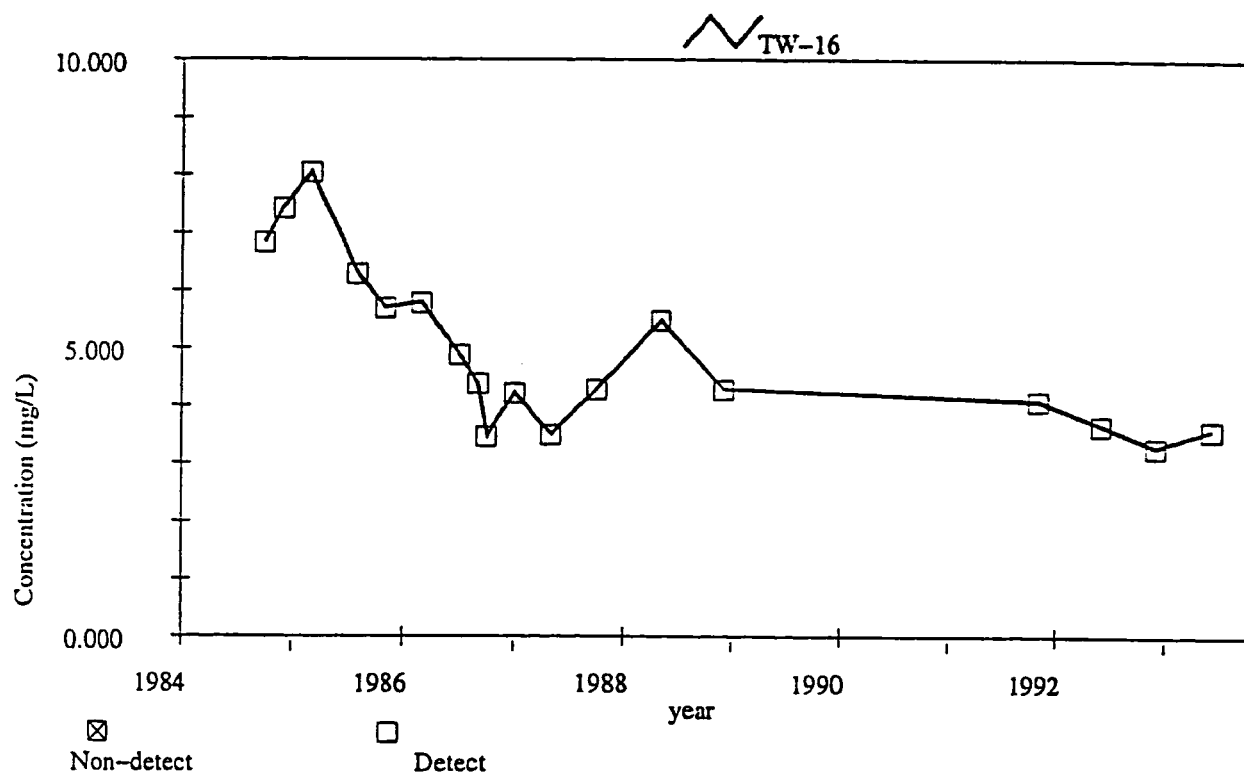


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID

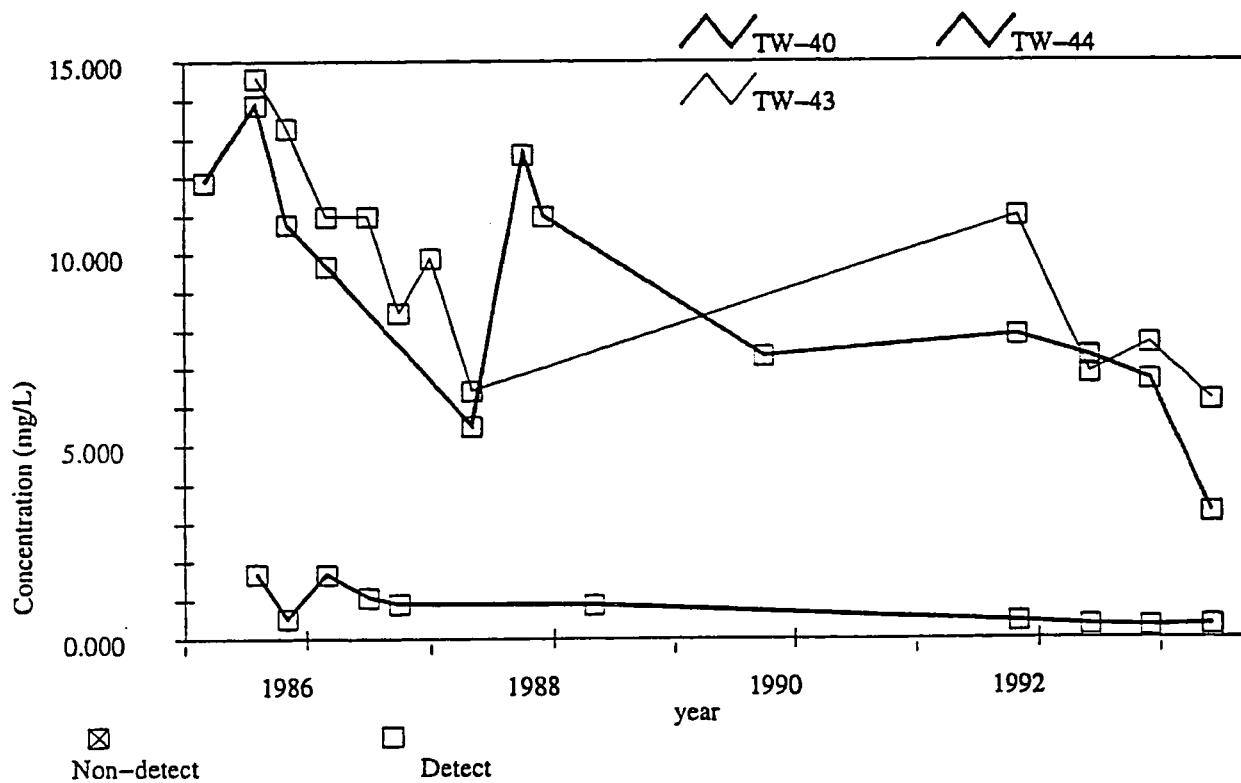


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II R/ID

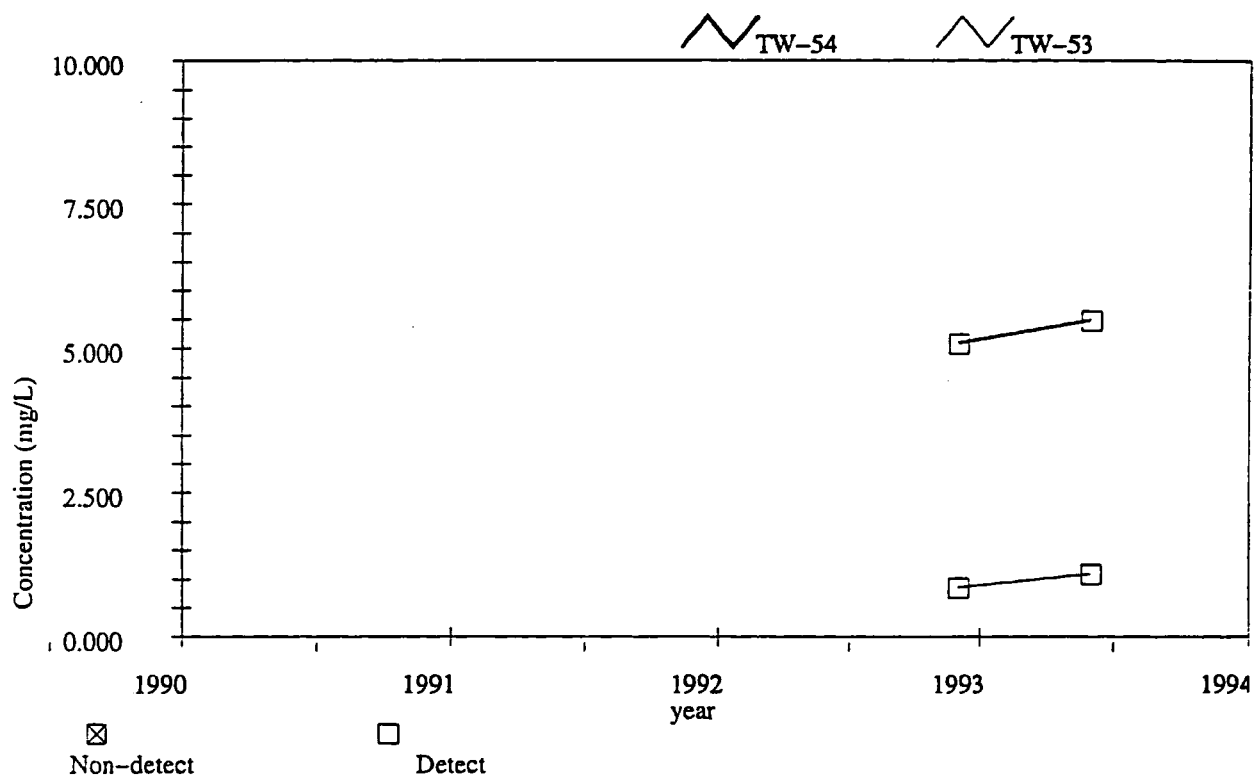


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-54  
MONSANTO/PHASE II R/ID

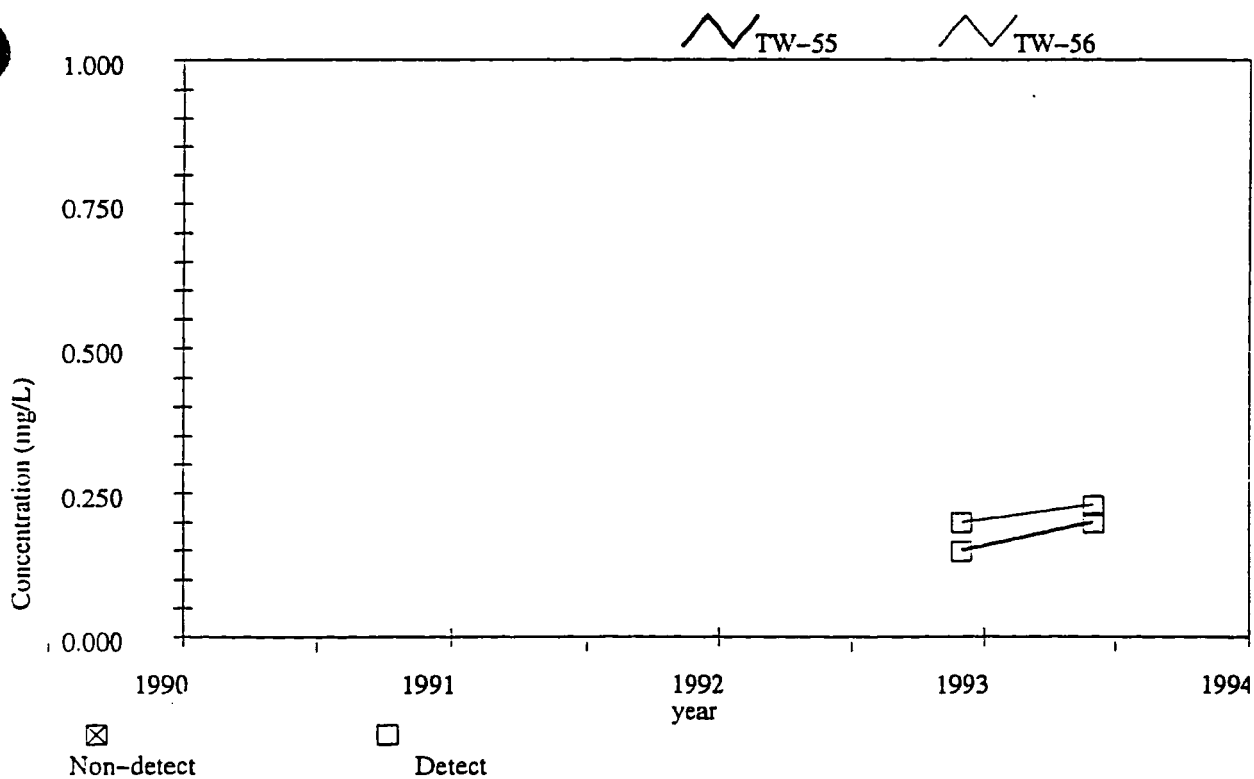


FIGURE  
Fluoride CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTOPHASE II R/ID

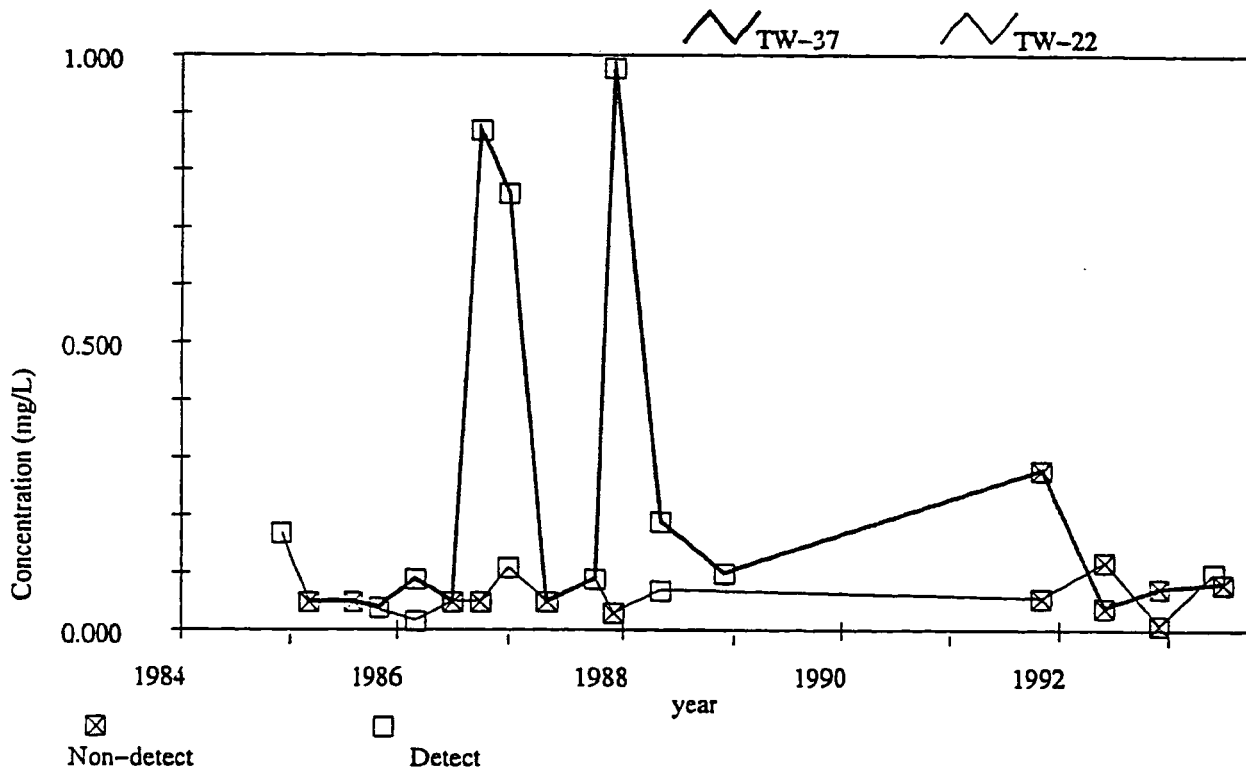


FIGURE  
Iron CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

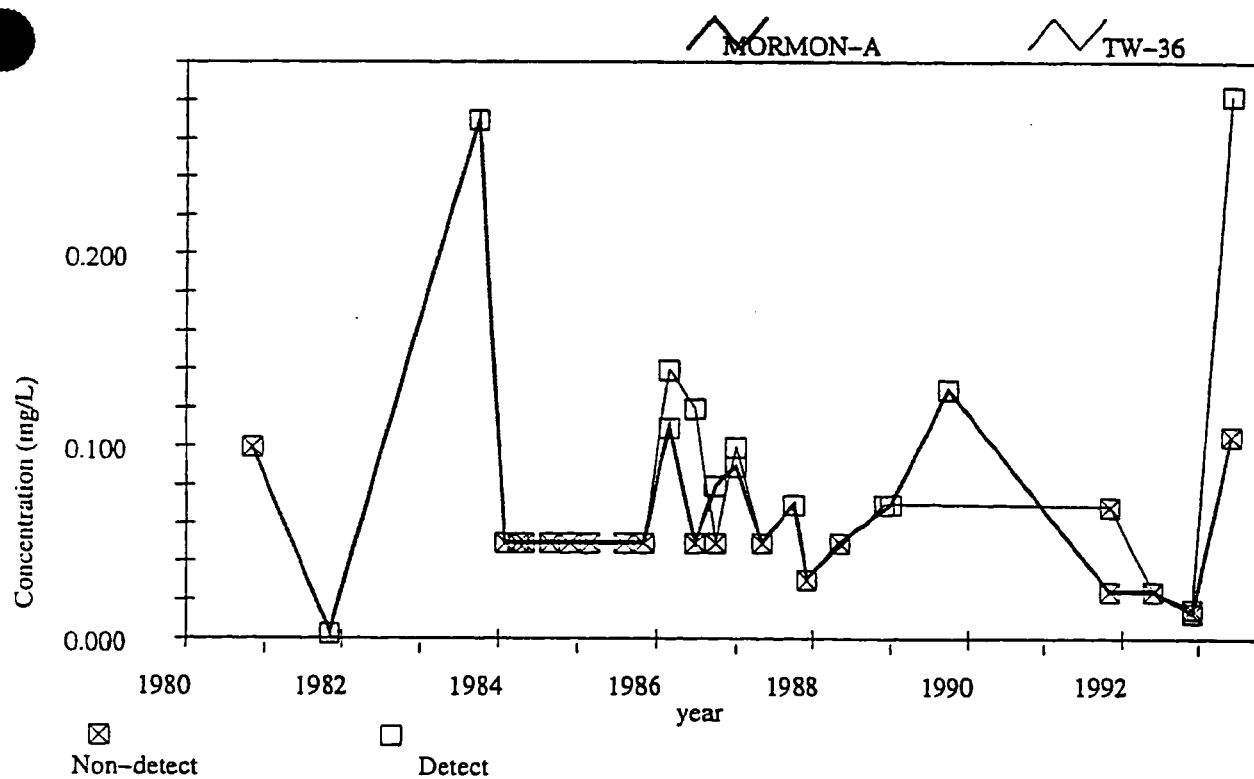


FIGURE  
Iron CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

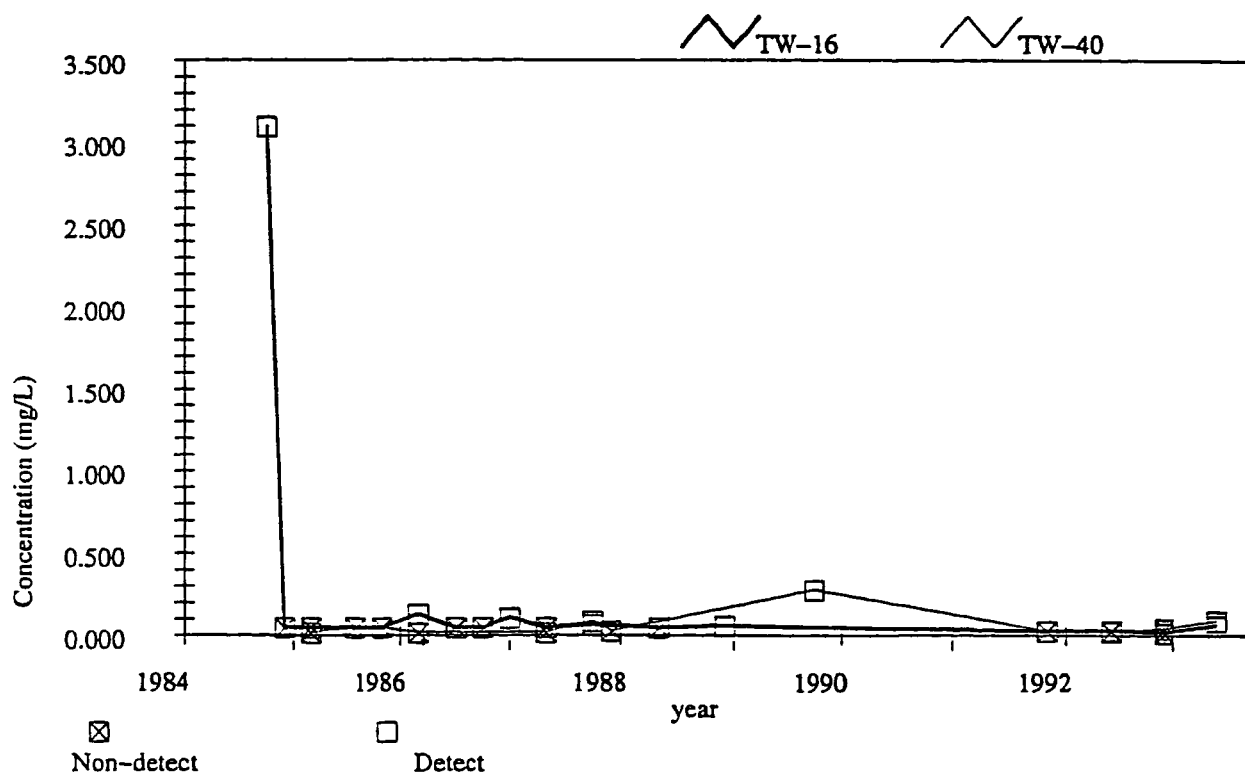


FIGURE  
Iron CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II RI/ID

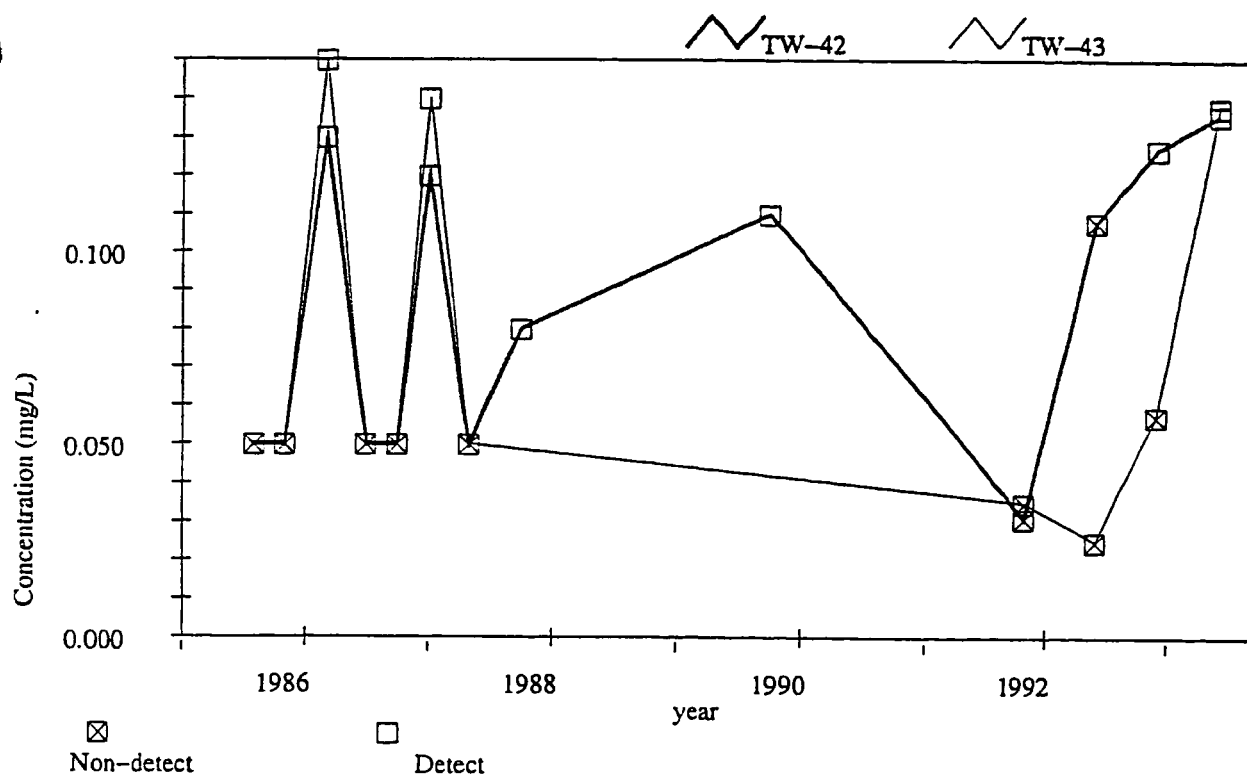


FIGURE  
Iron CONCENTRATION TIME HISTORY  
FOR TW-42  
MONSANTO/PHASE II RI/ID

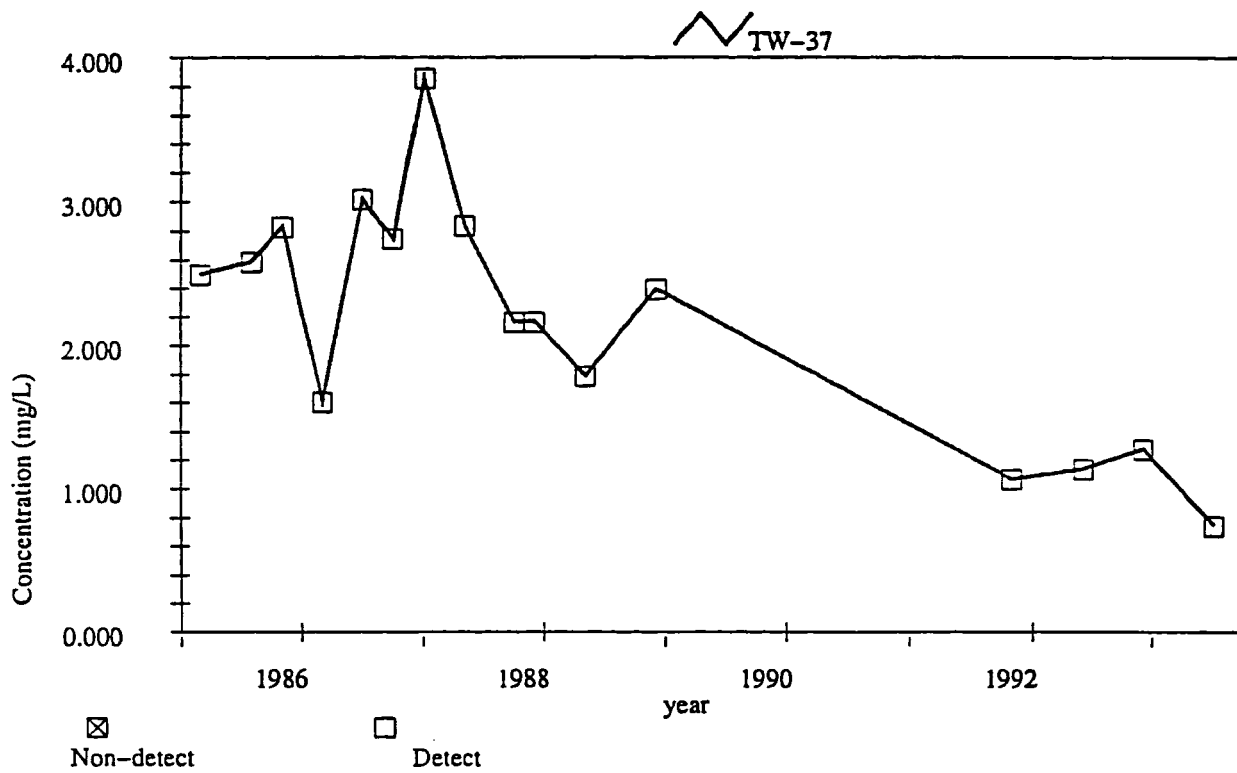


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

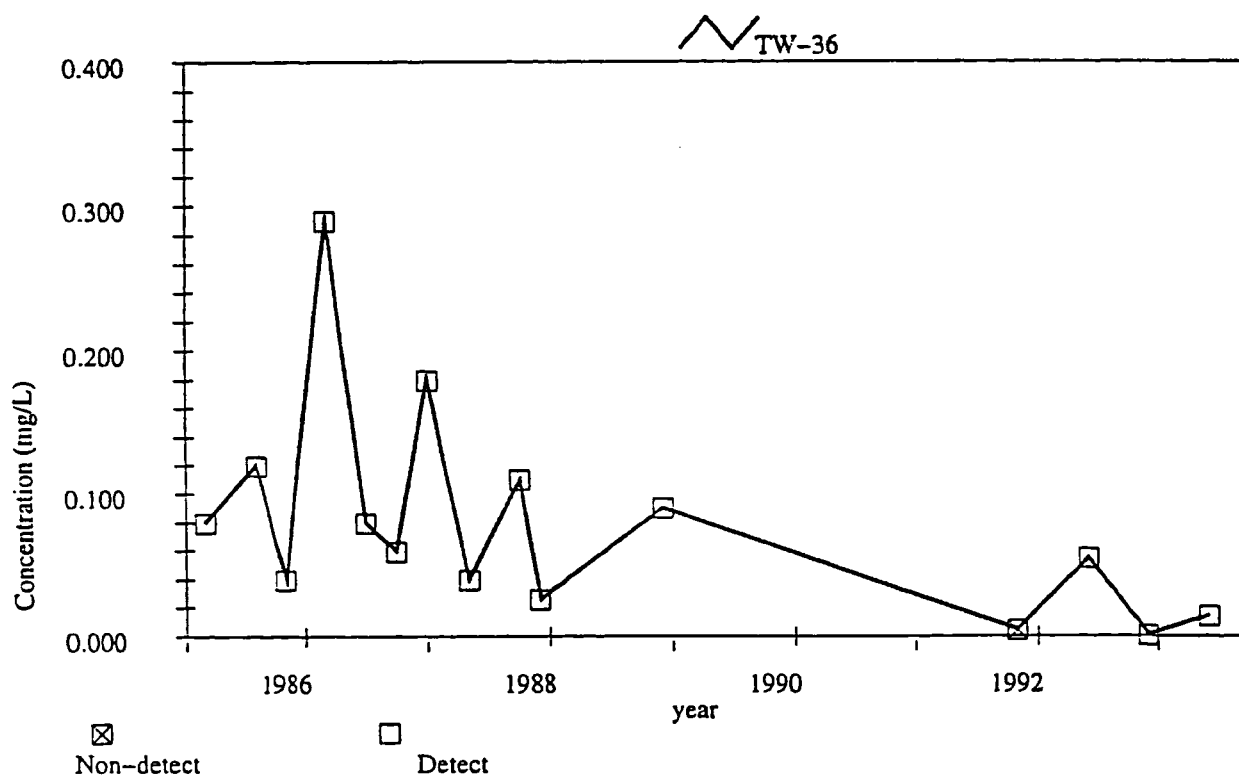


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II RI/ID

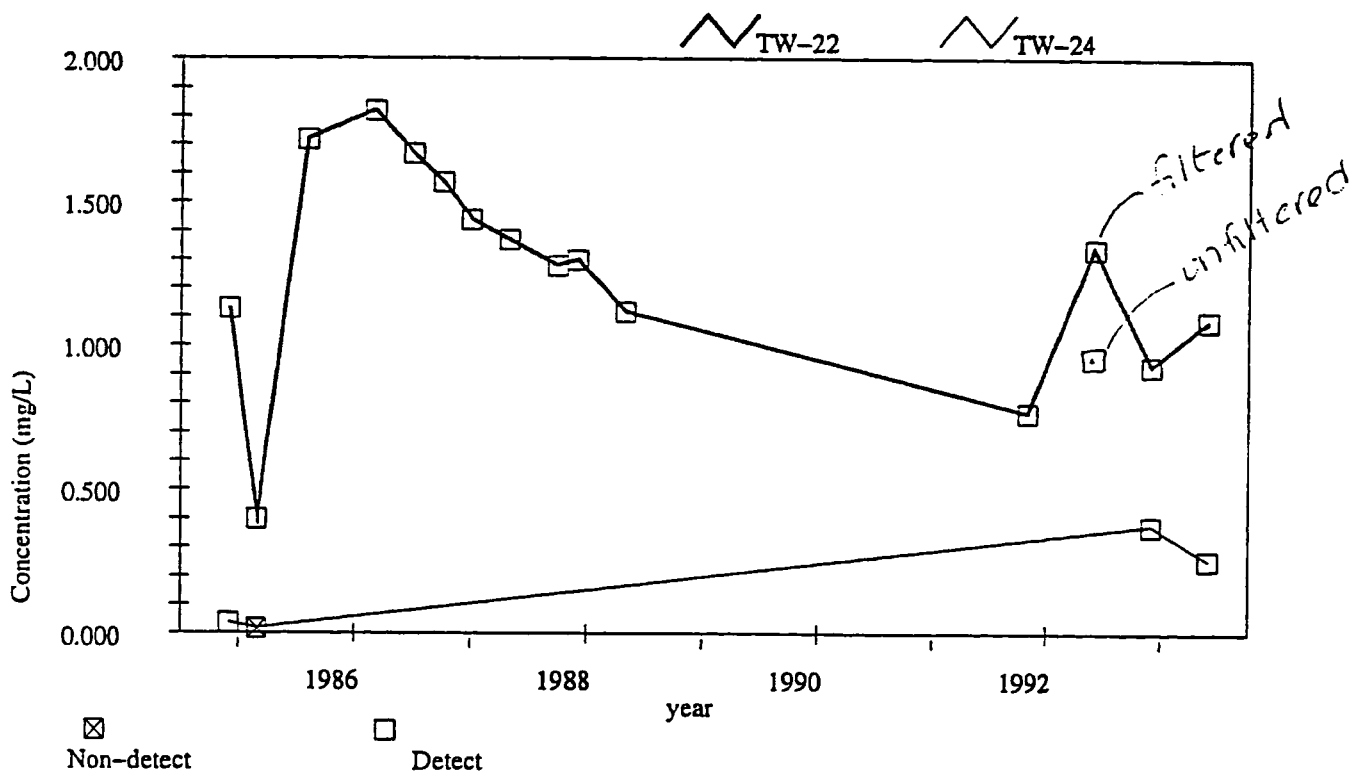


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/I/D

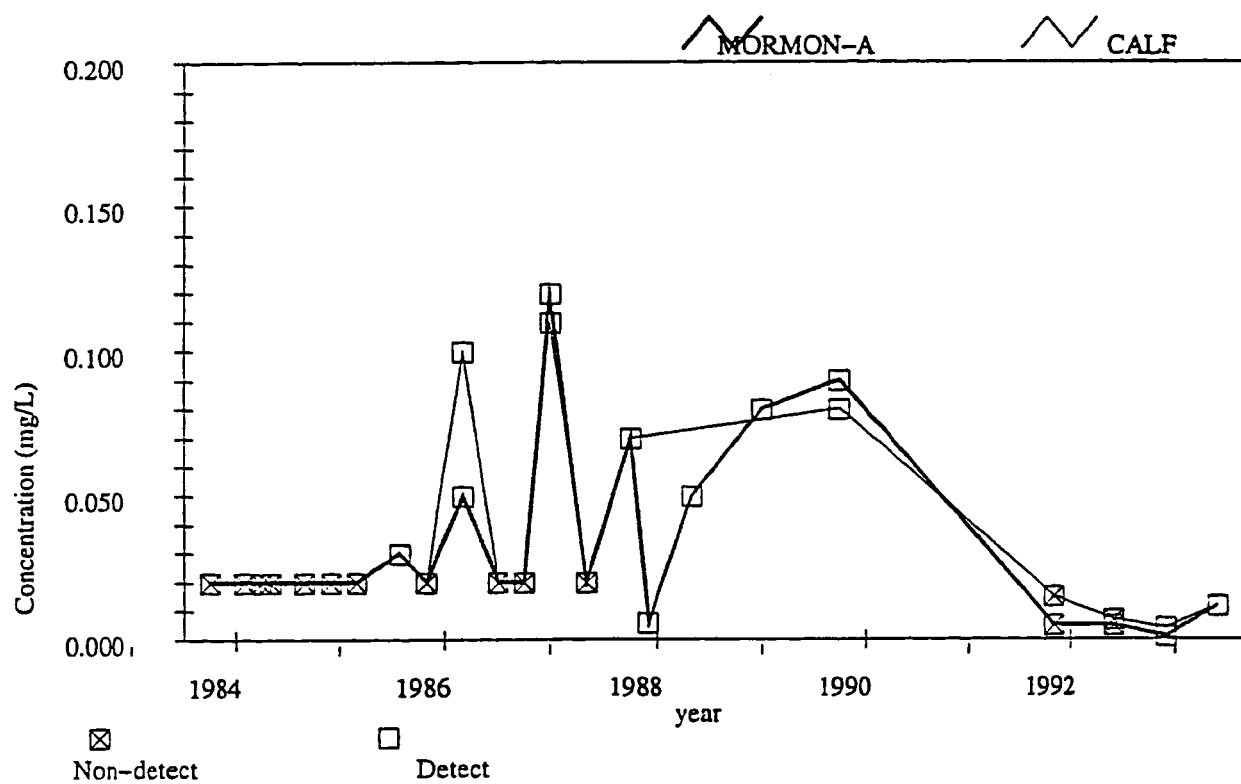


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

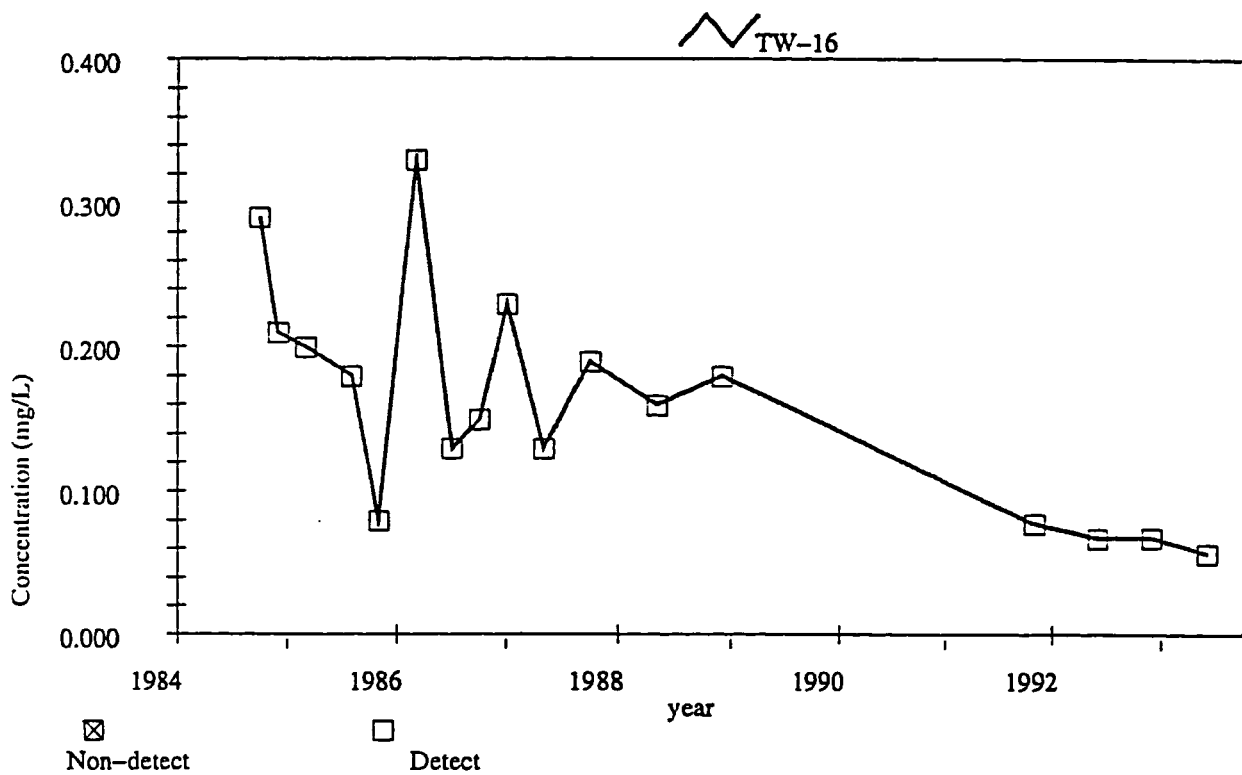


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID

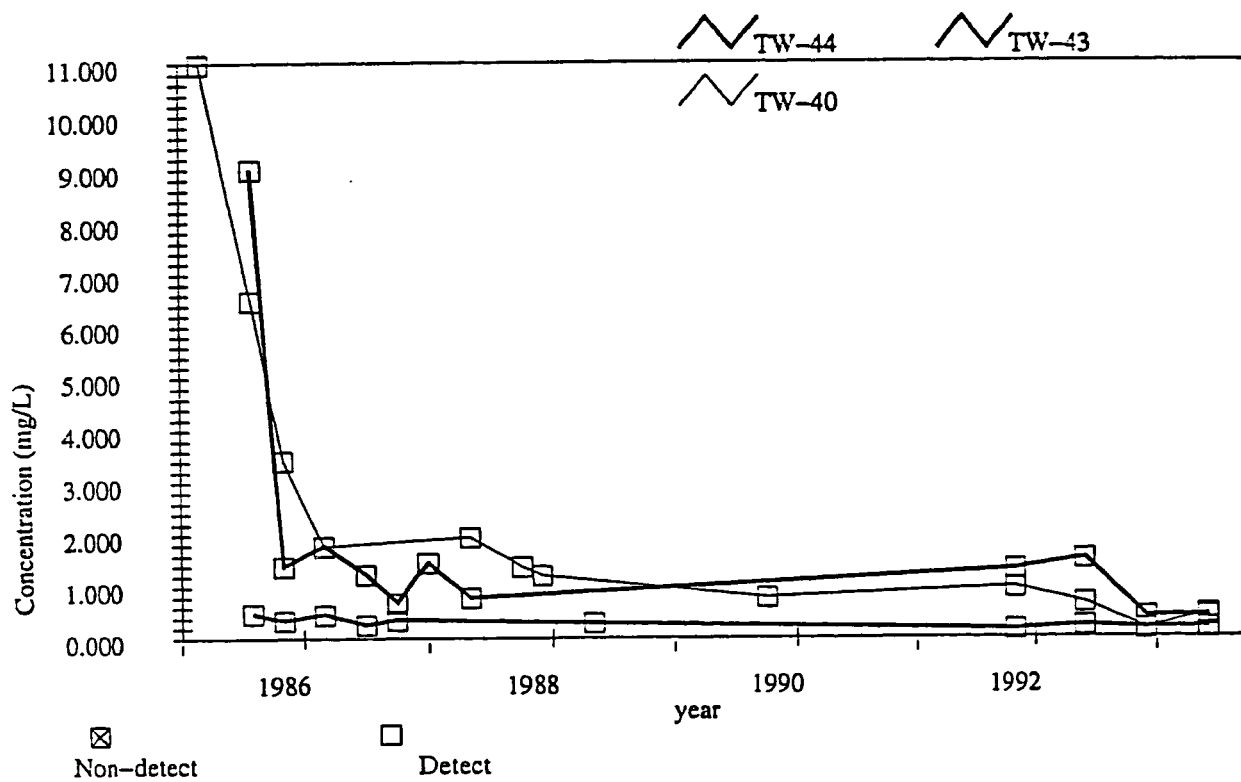


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-44  
MONSANTO/PHASE II R/I/D

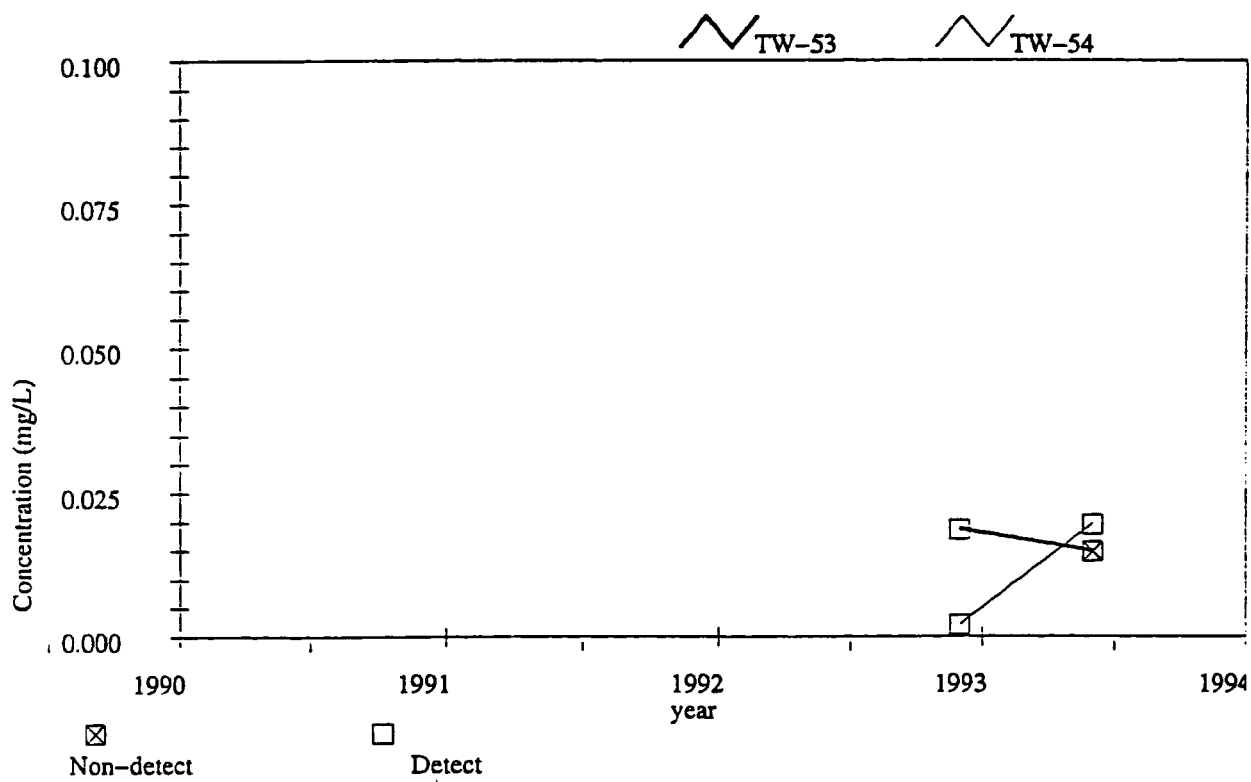


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

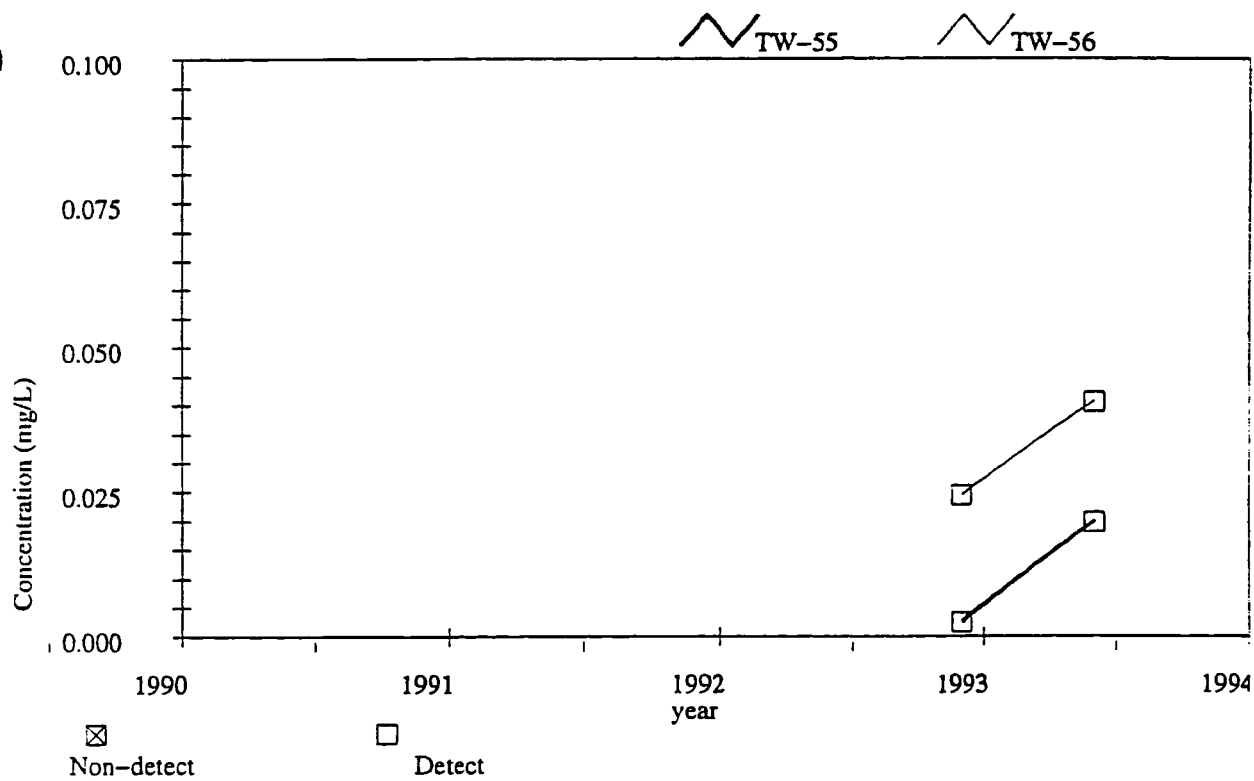


FIGURE  
Manganese CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/I/D

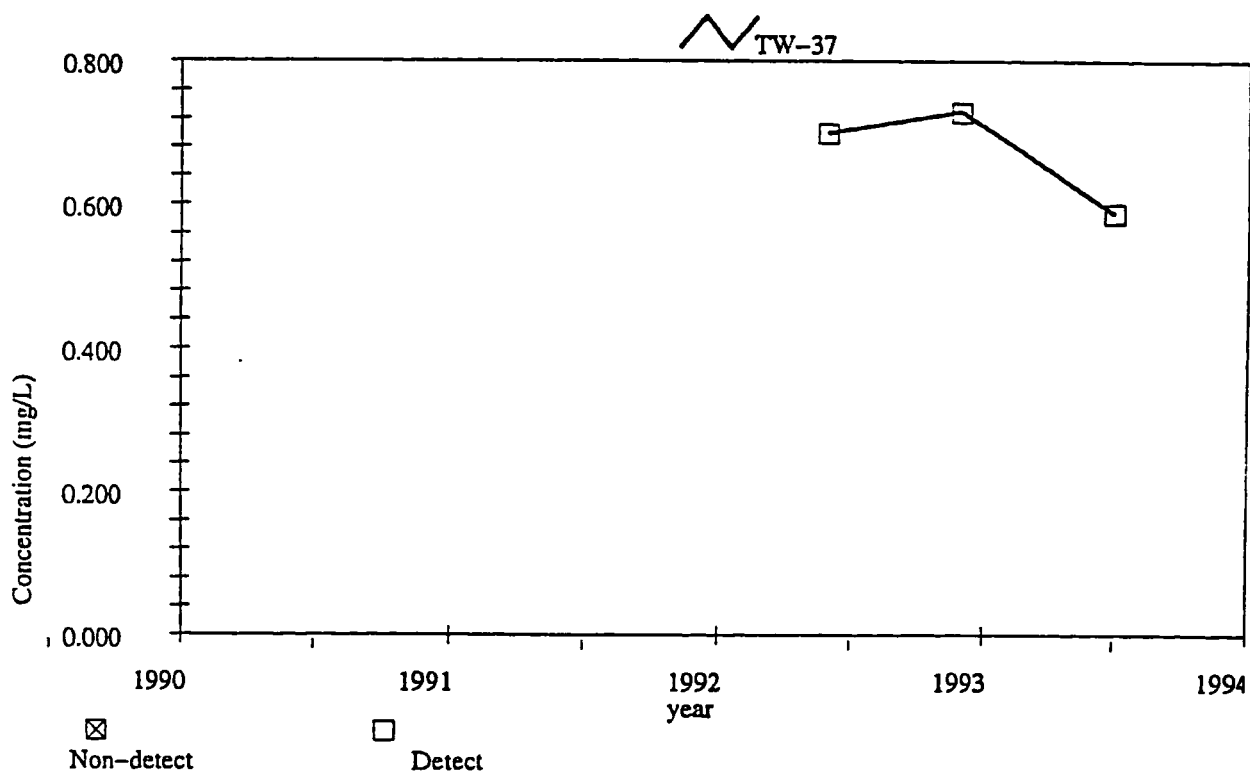


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

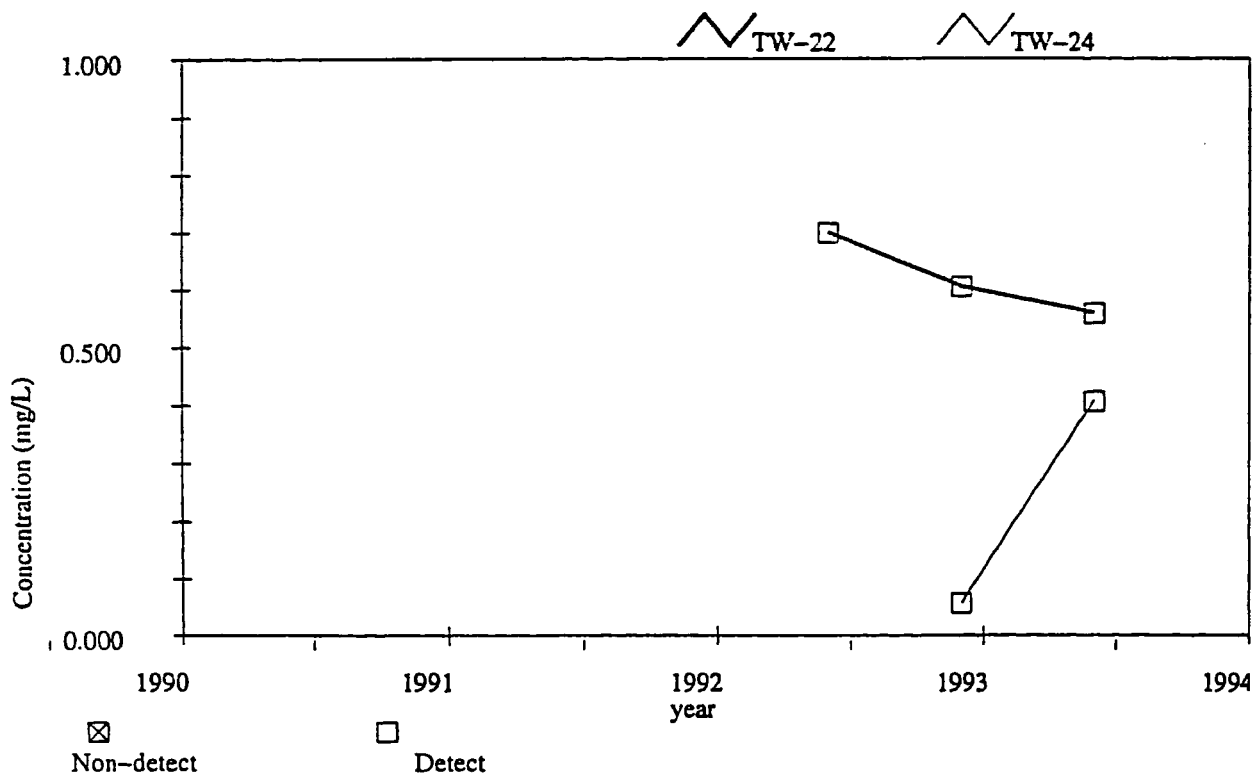


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

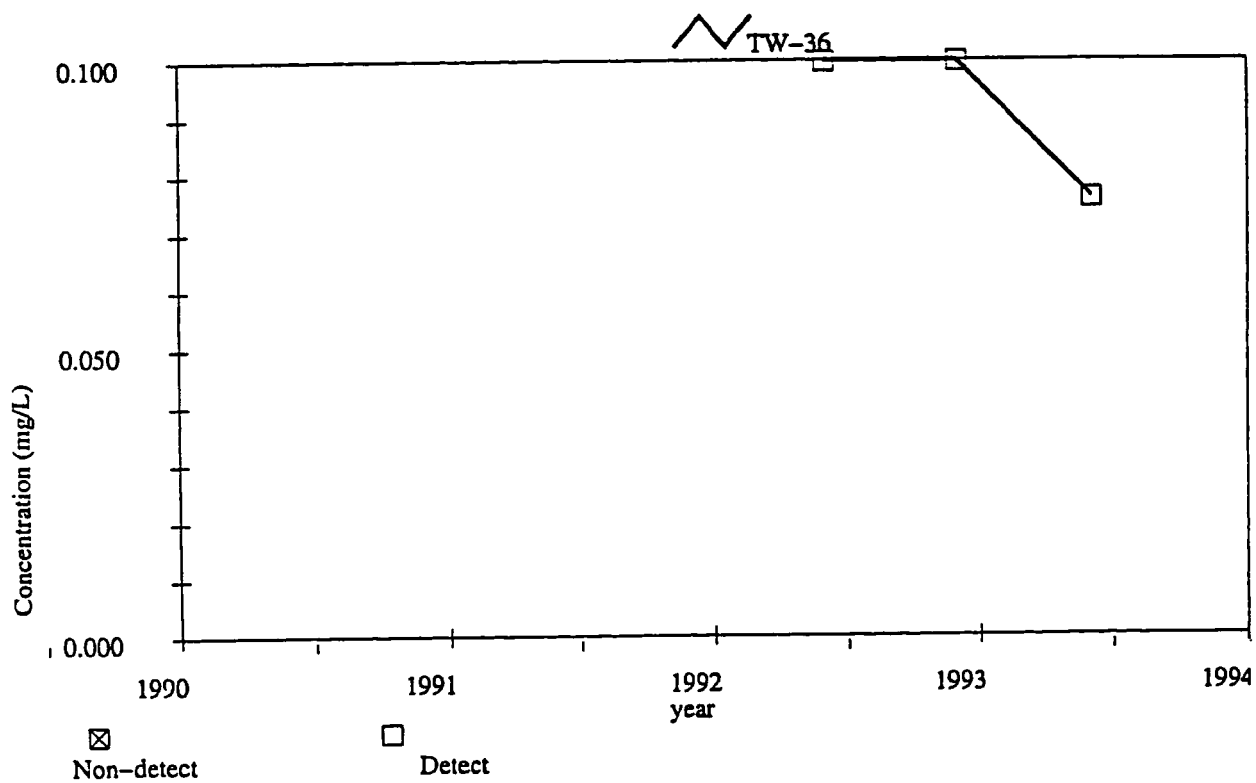


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II RI/ID

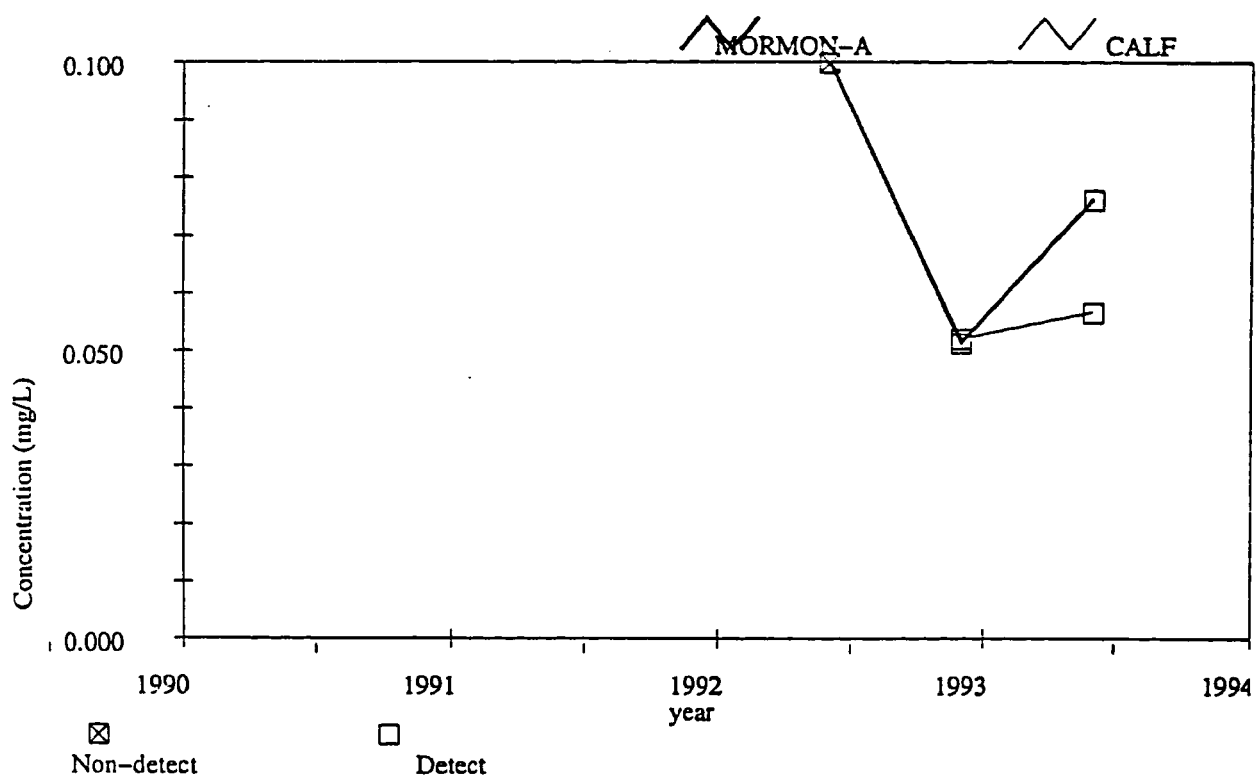


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

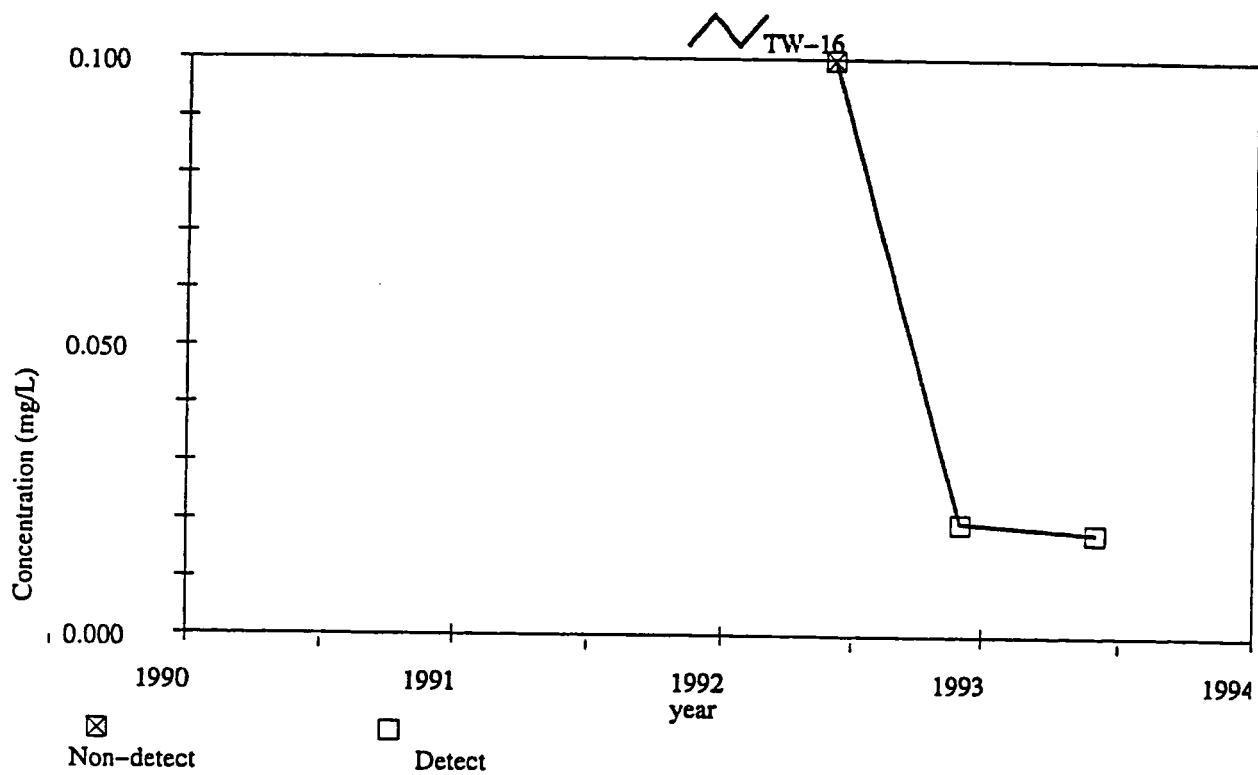


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID

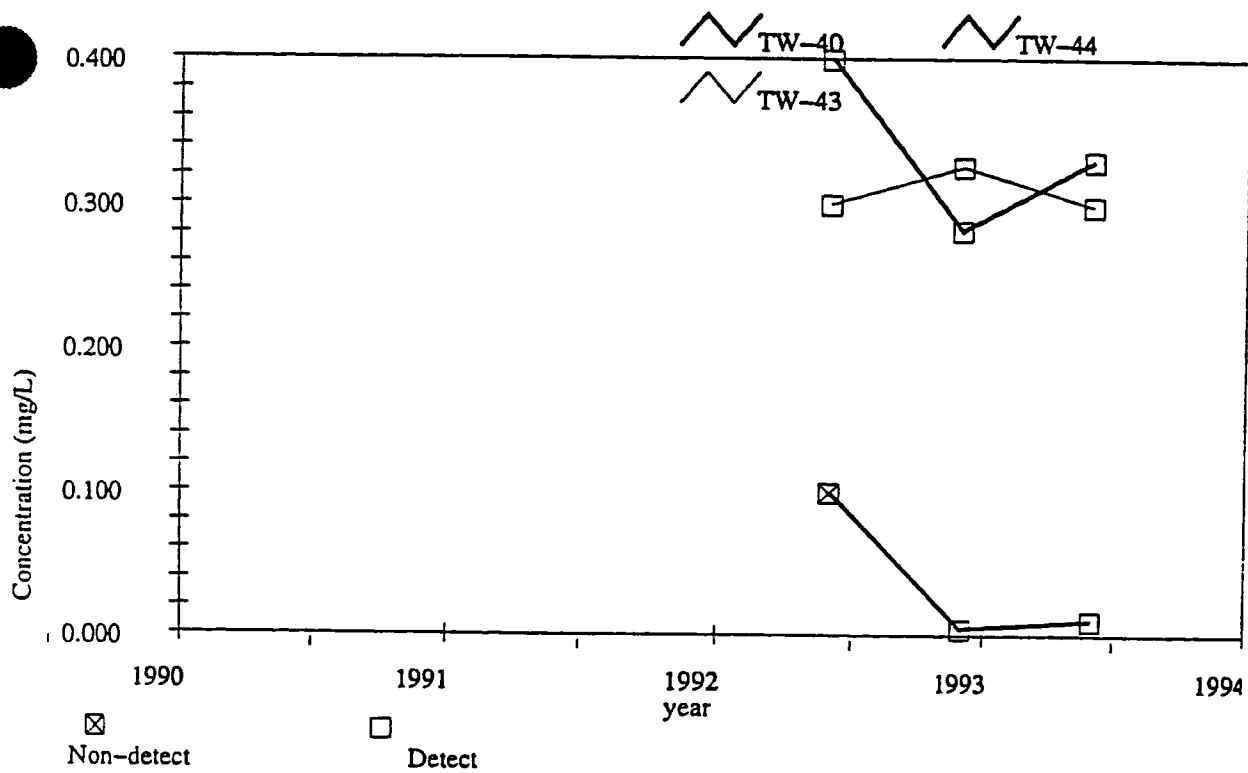


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II RI/ID

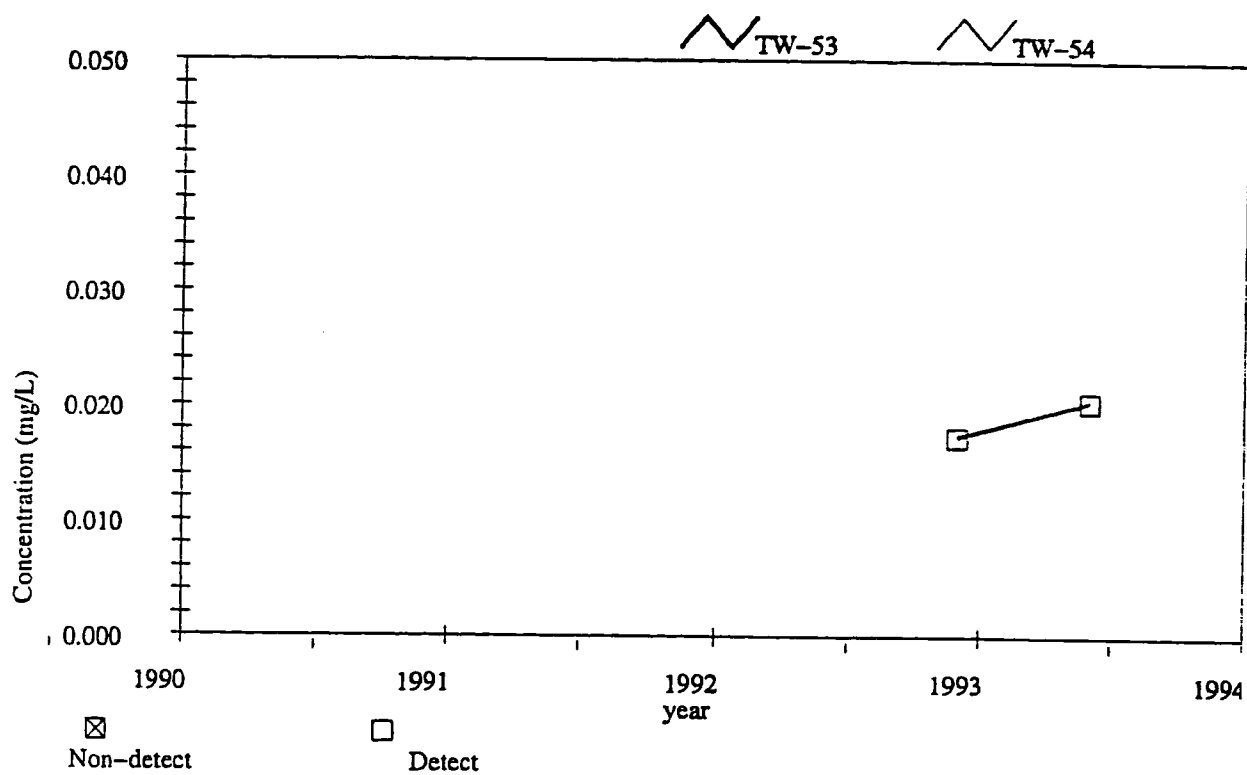


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

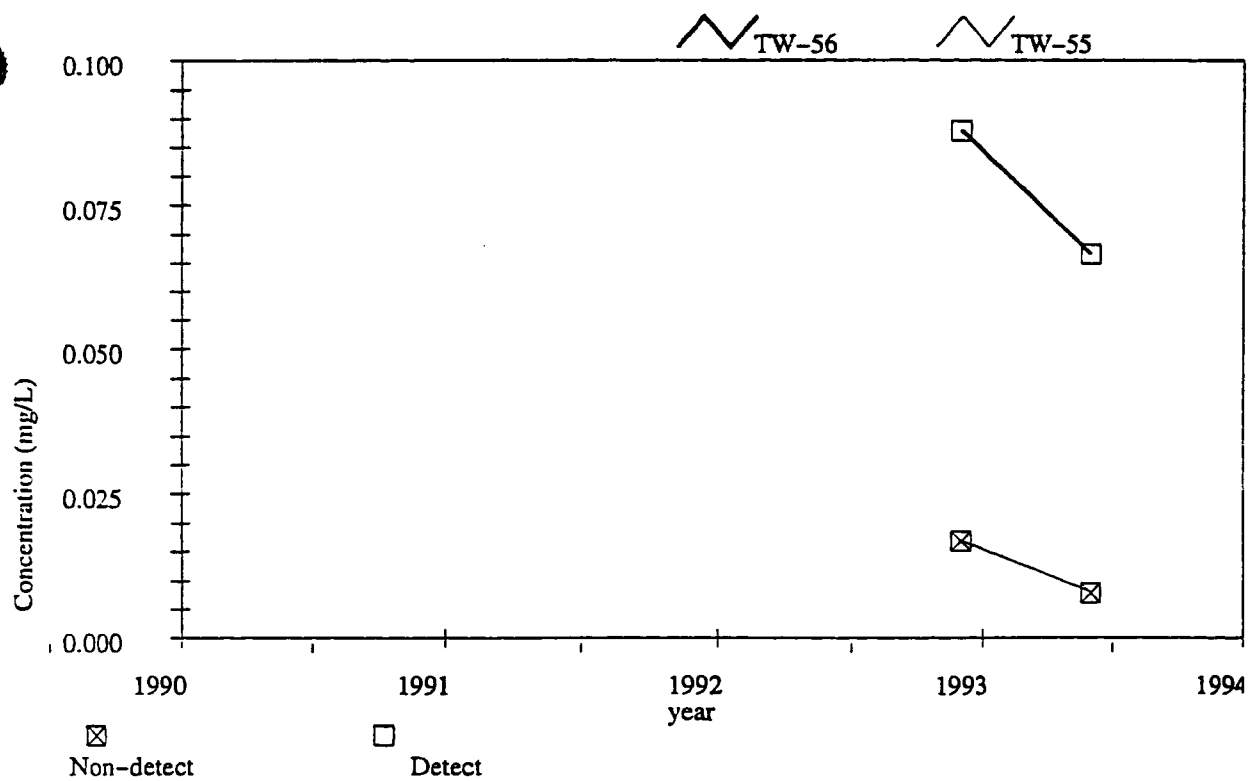


FIGURE  
Molybdenum CONCENTRATION TIME HISTORY  
FOR TW-56  
MONSANTO/PHASE II R/ID

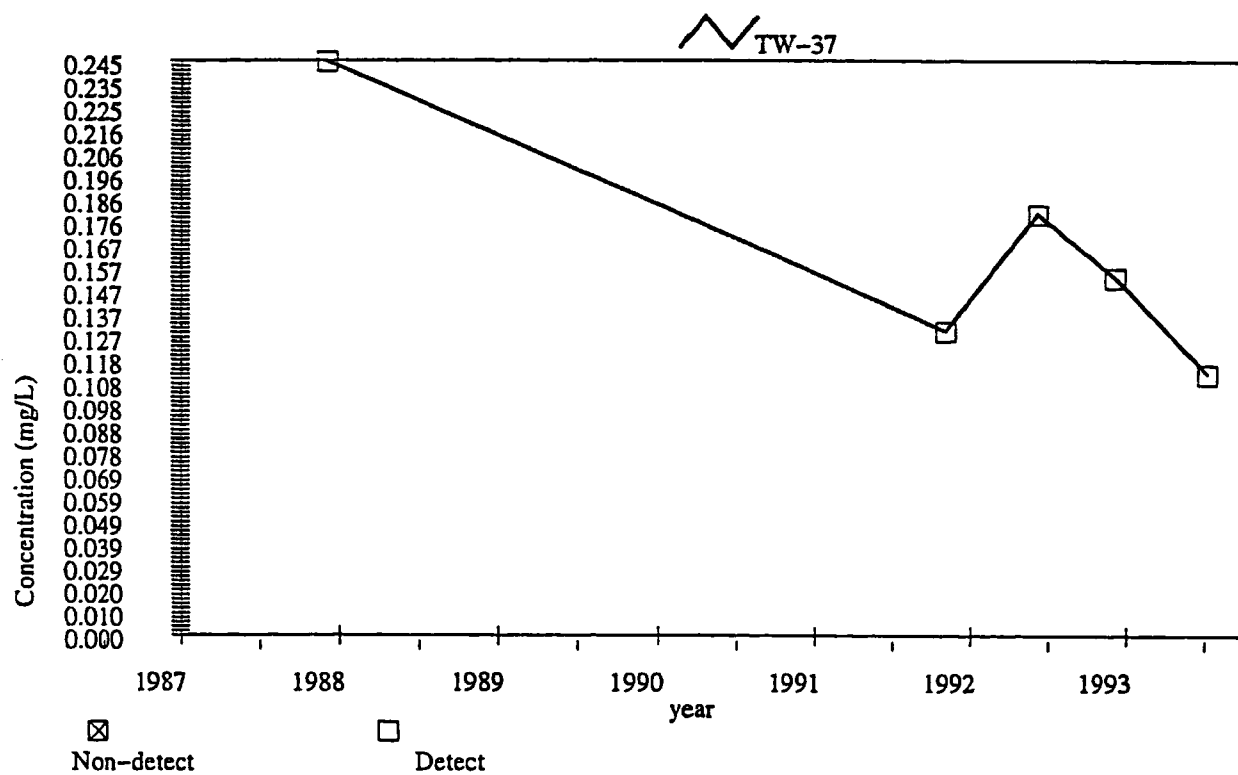


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

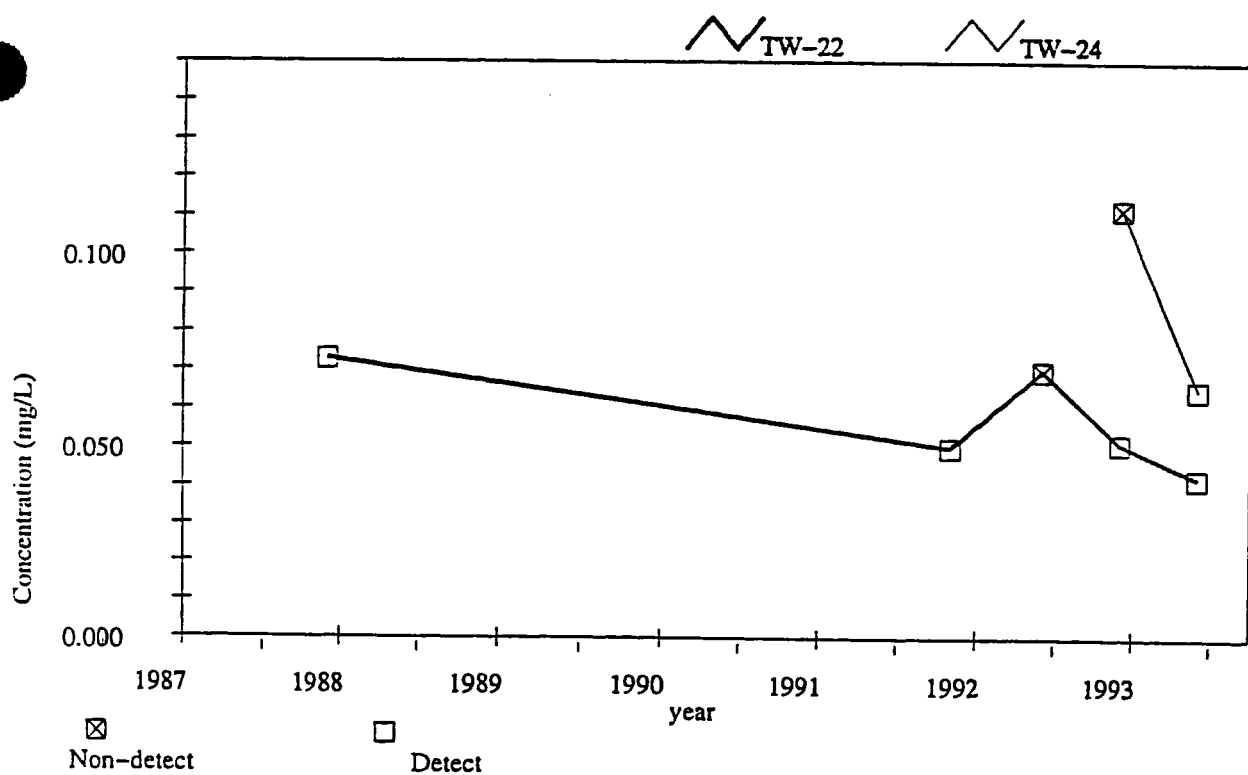


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

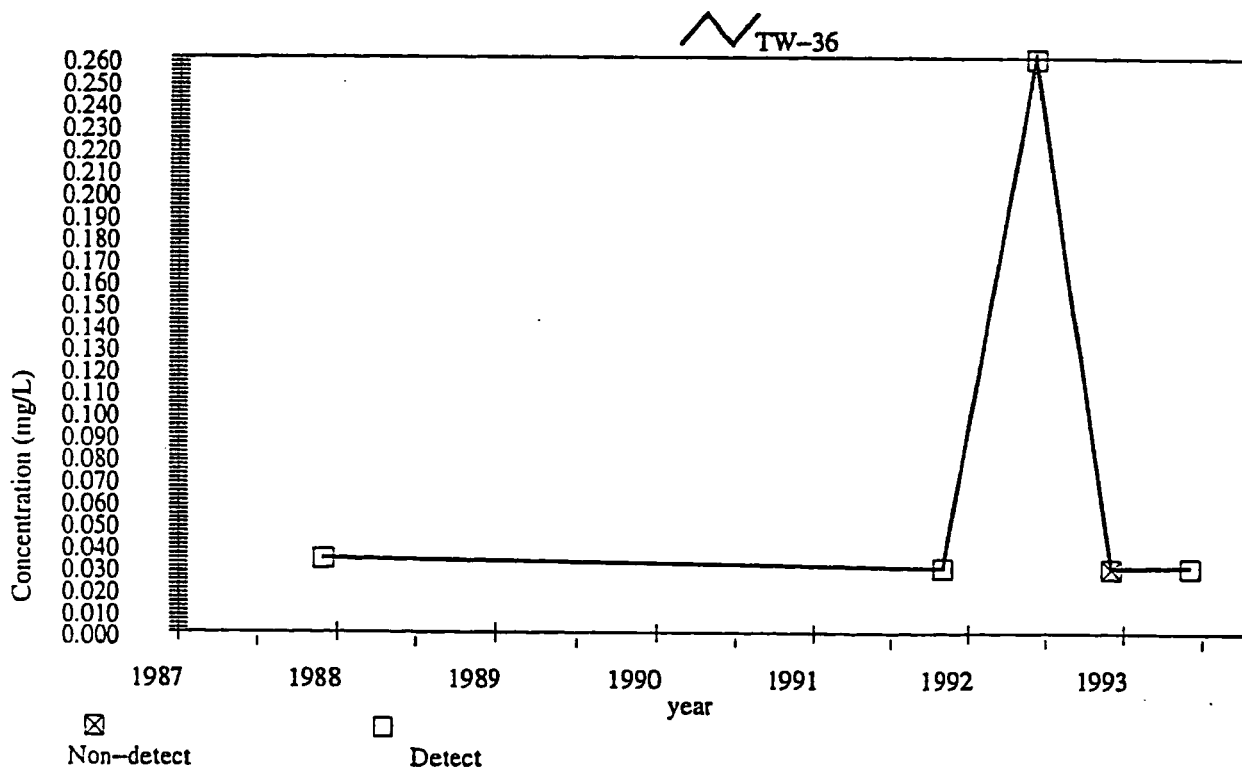


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

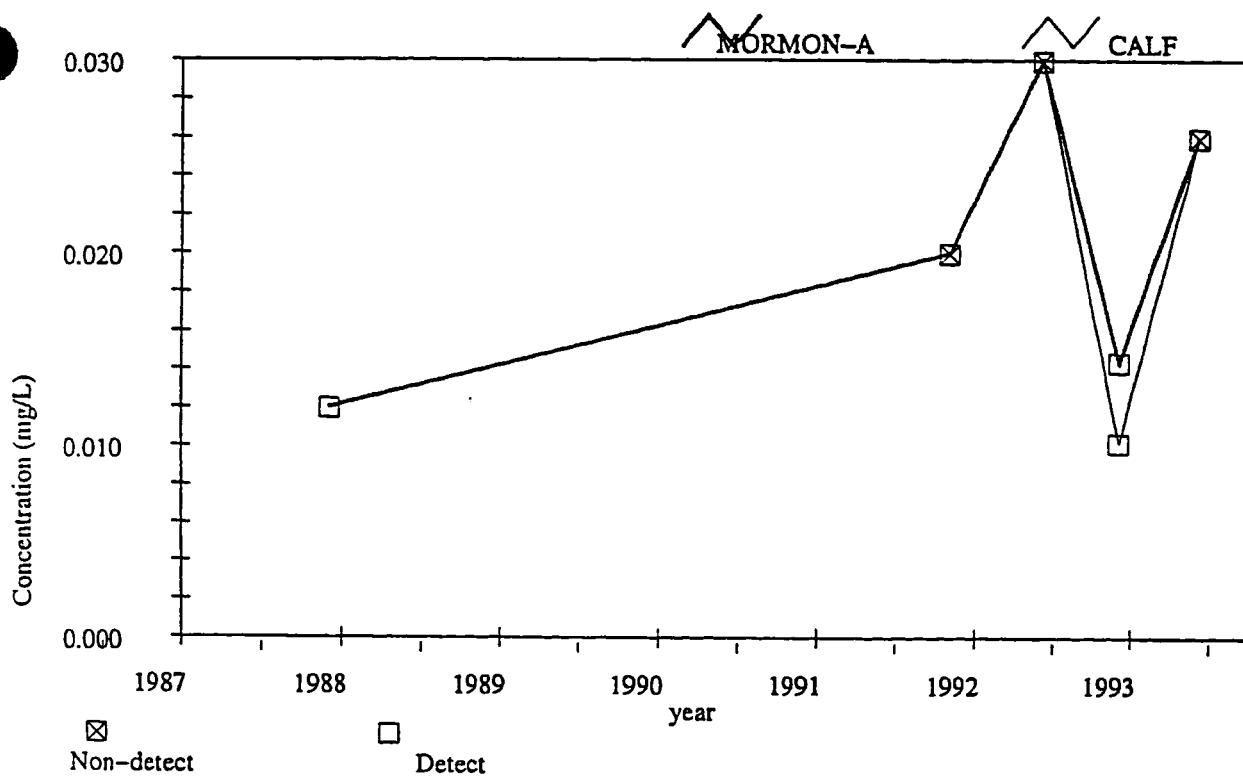


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

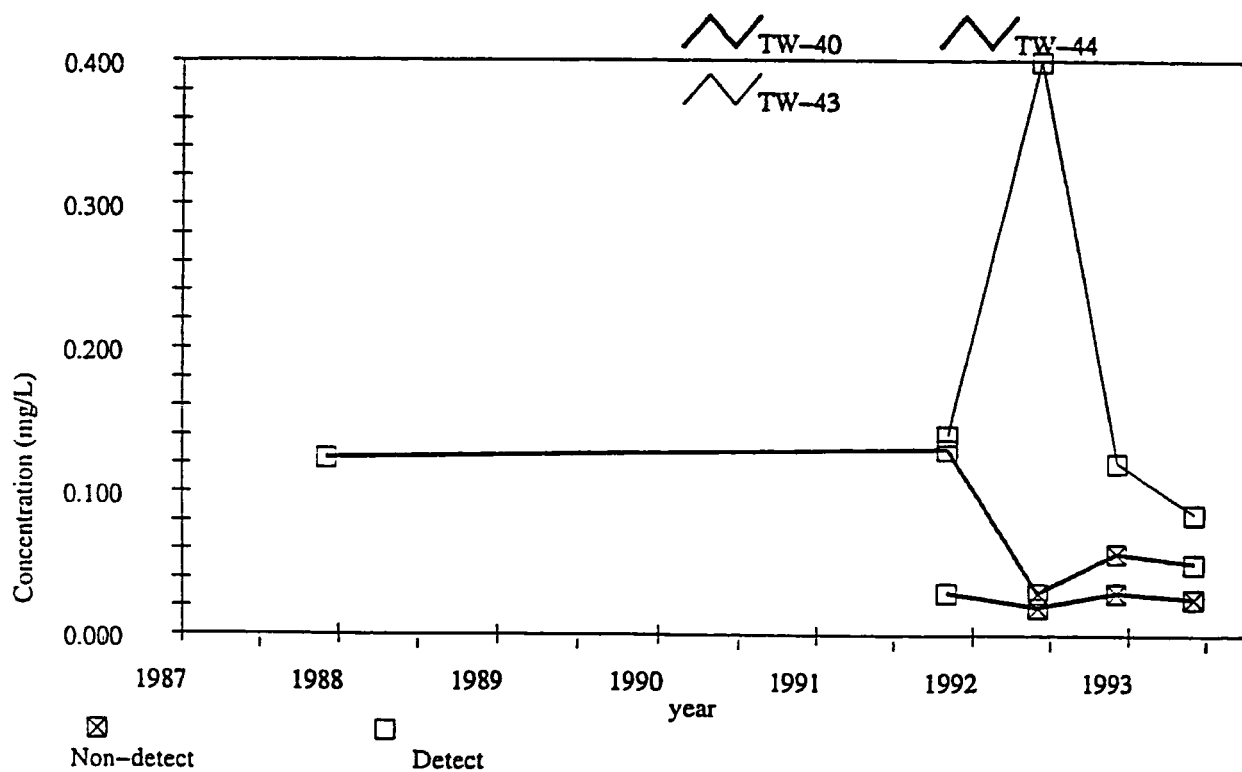


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II R/ID

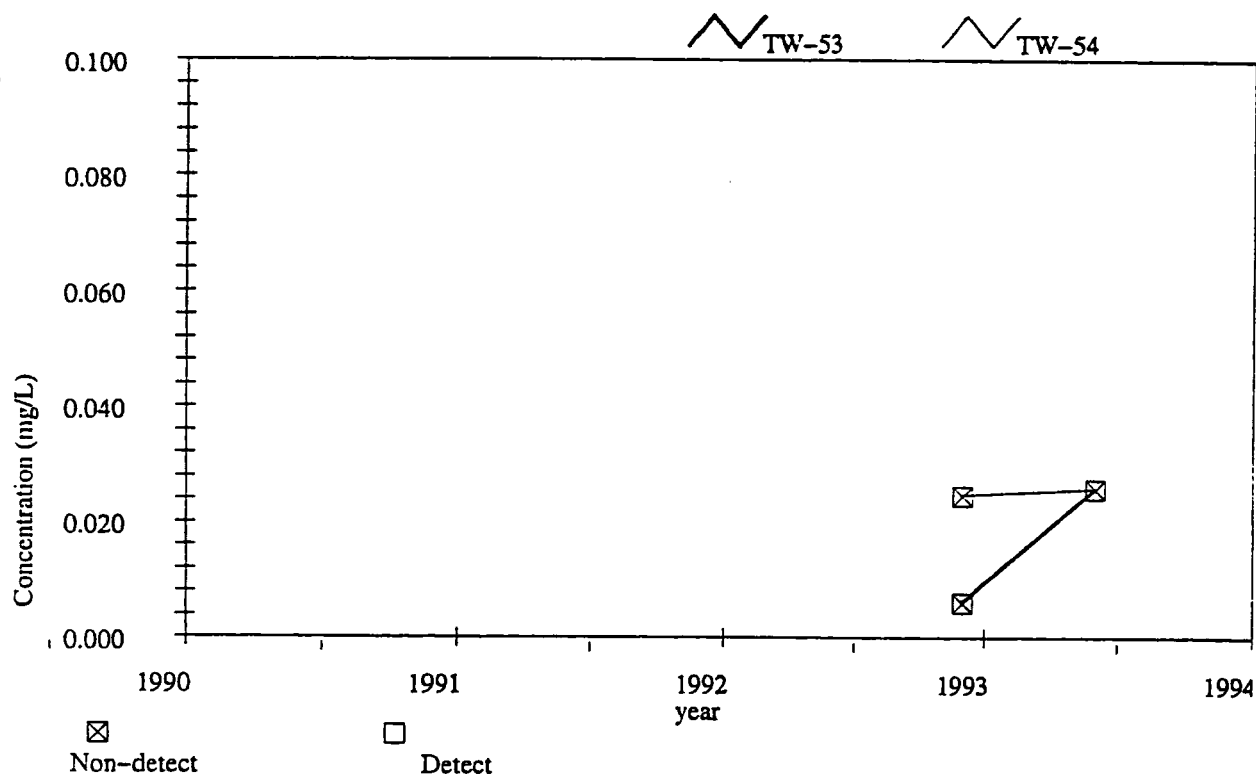


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/I/D

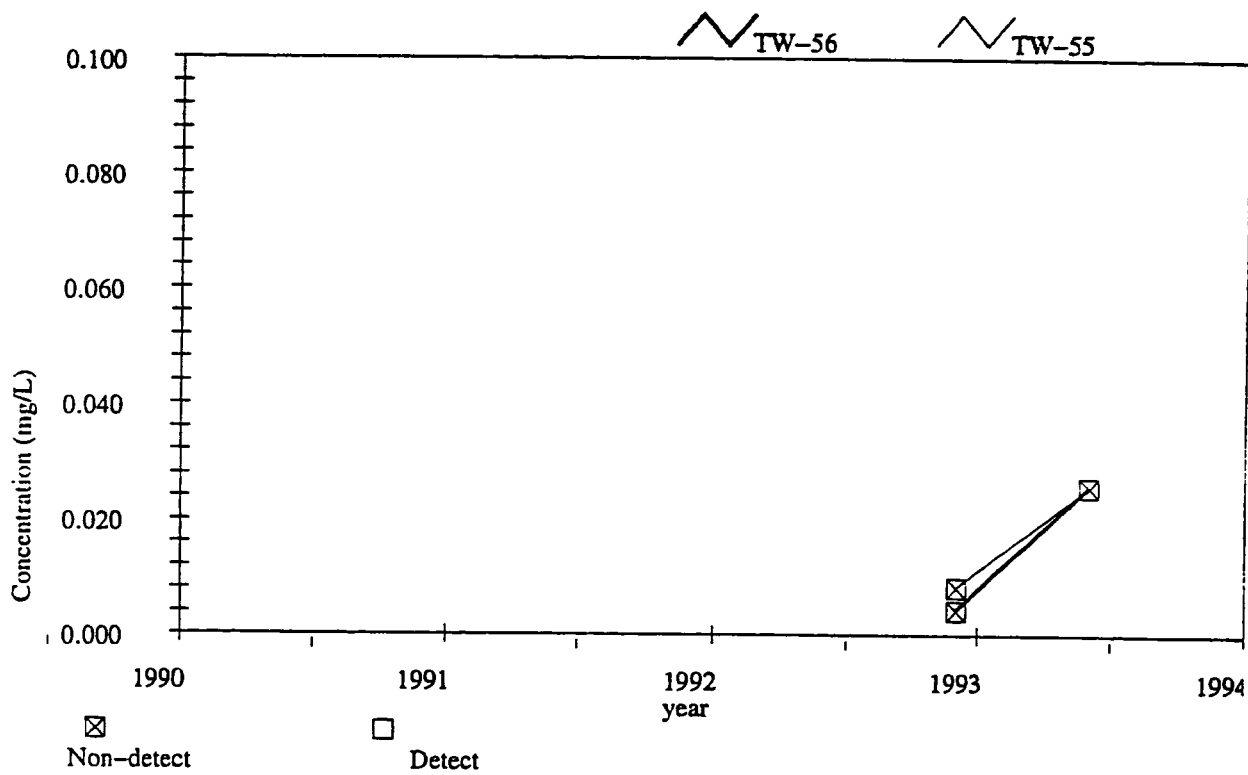


FIGURE  
Nickel CONCENTRATION TIME HISTORY  
FOR TW-56  
MONSANTO/PHASE II R/ID

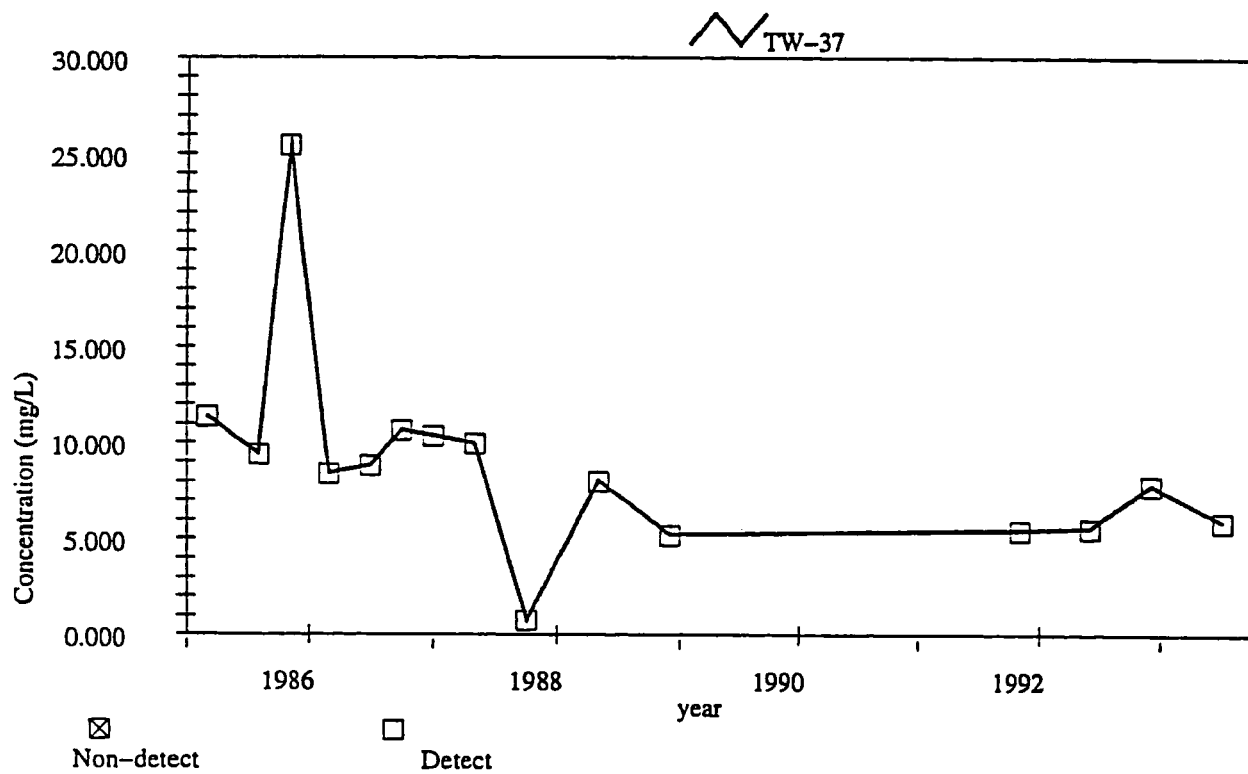


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

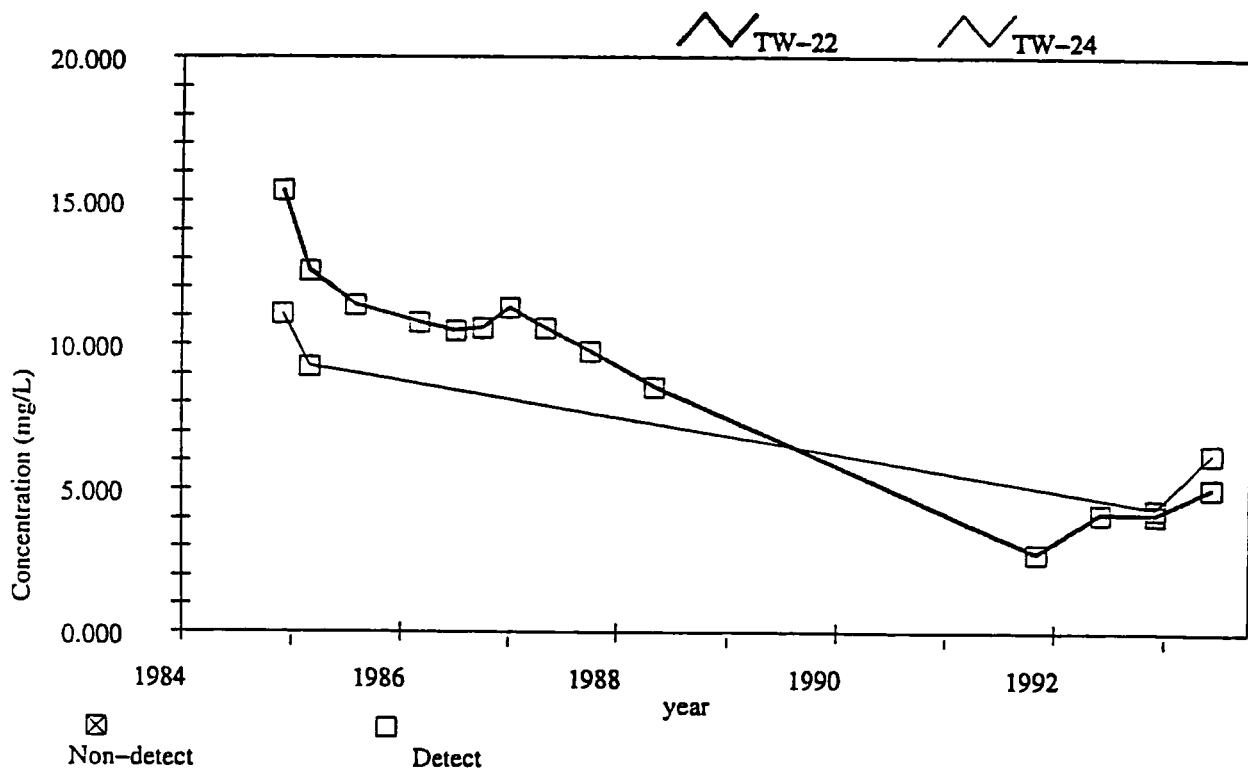


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

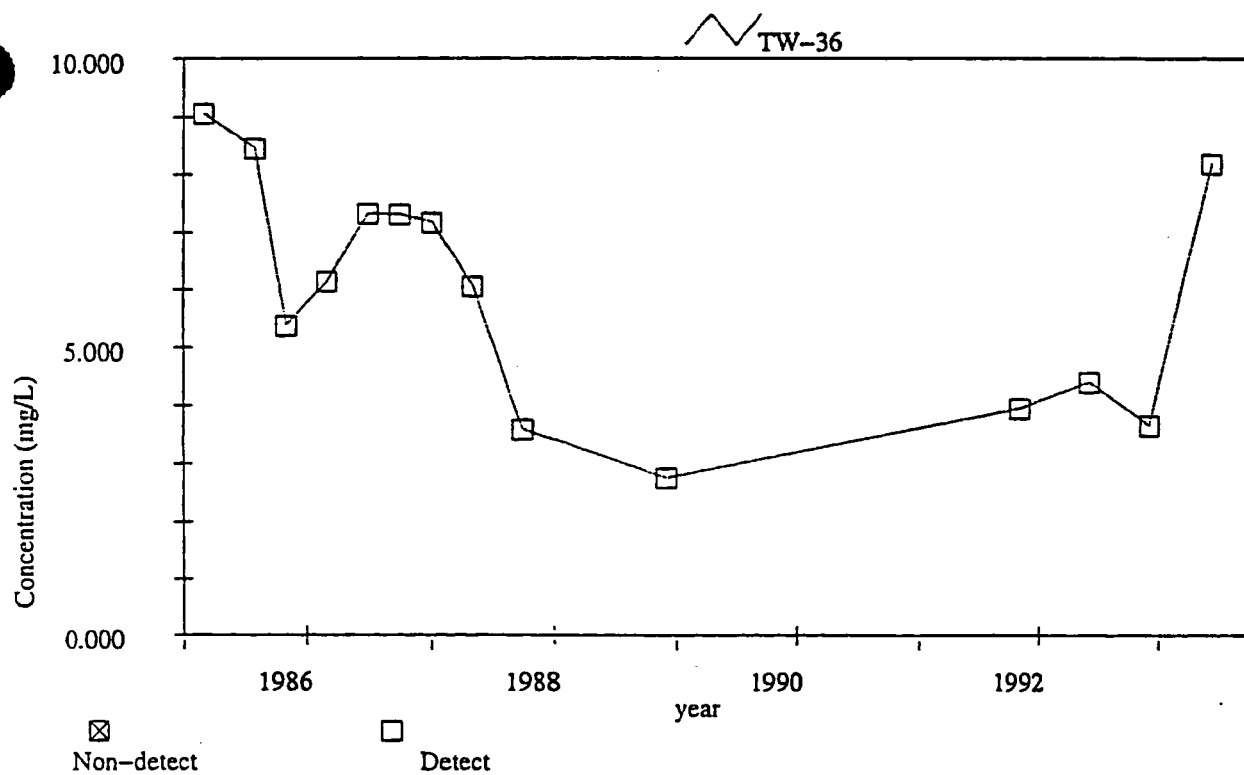


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

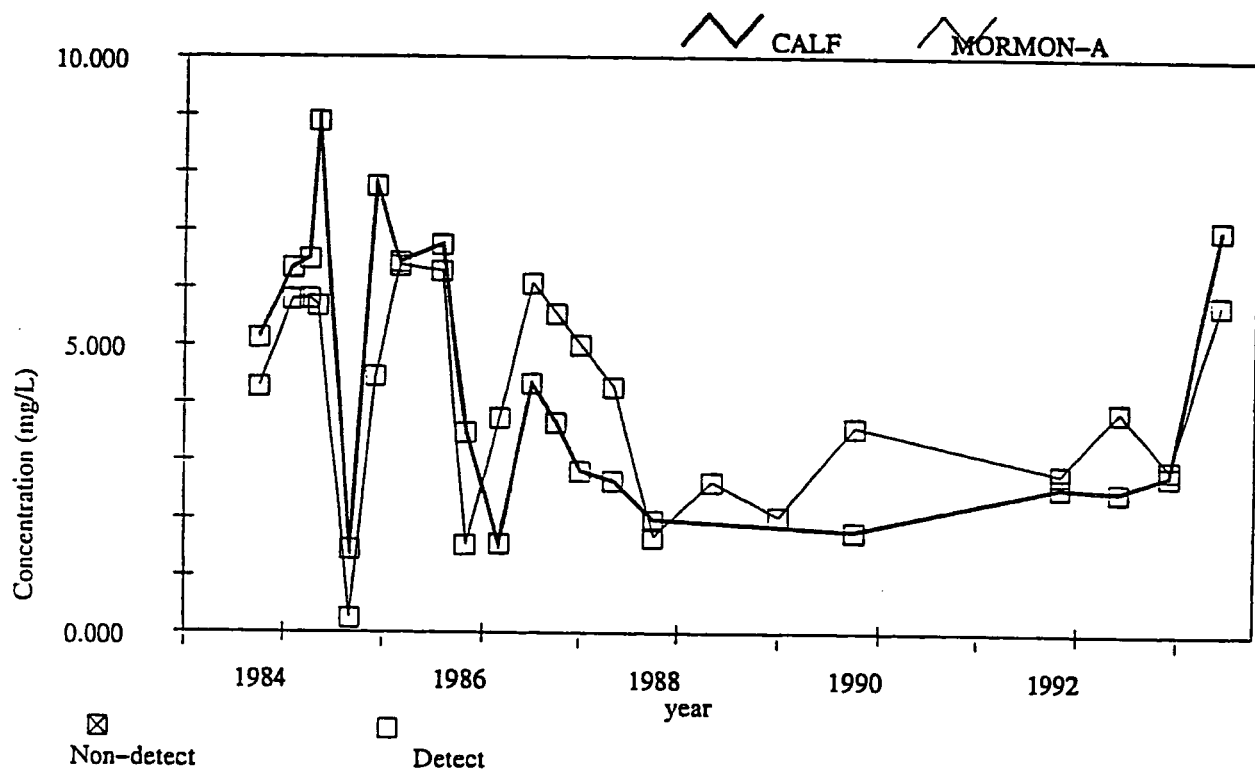


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR CALF  
MONSANTOPHASE II R/ID

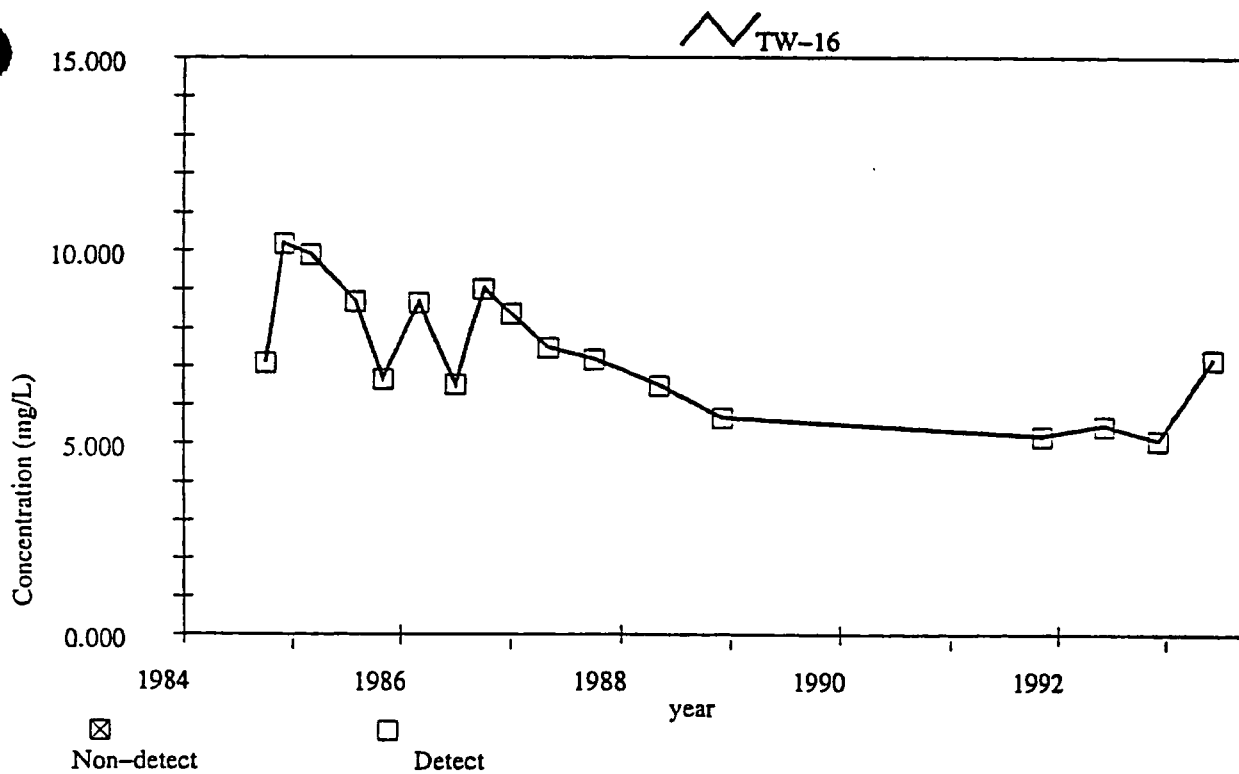


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTOPHASE II R/ID

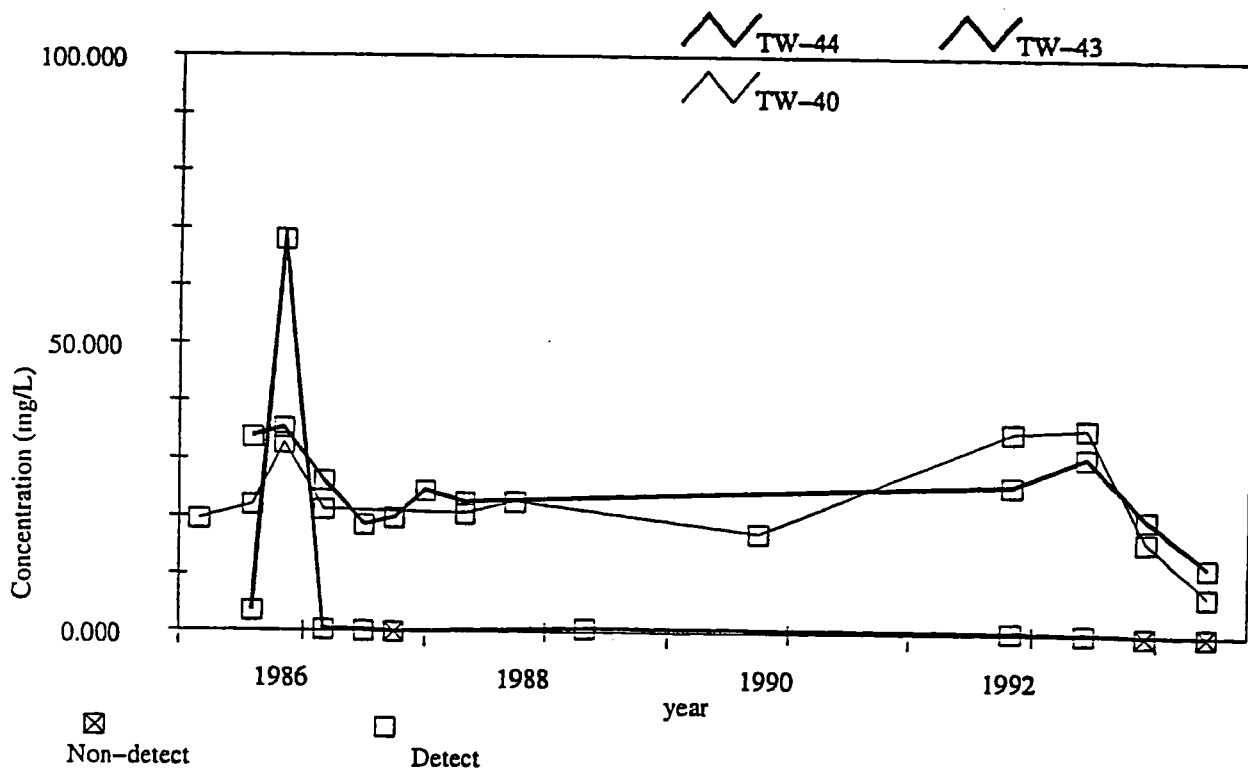


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-44  
MONSANTO/PHASE II R/I/D

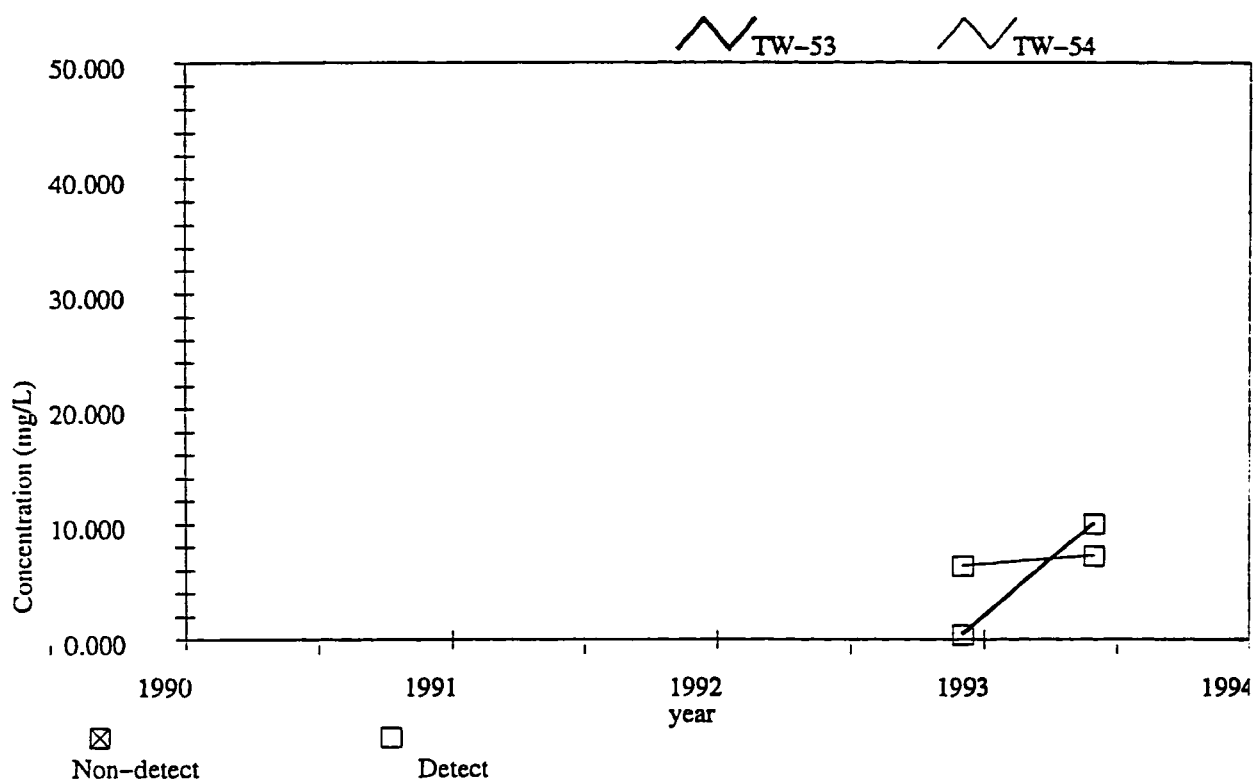


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II R/ID

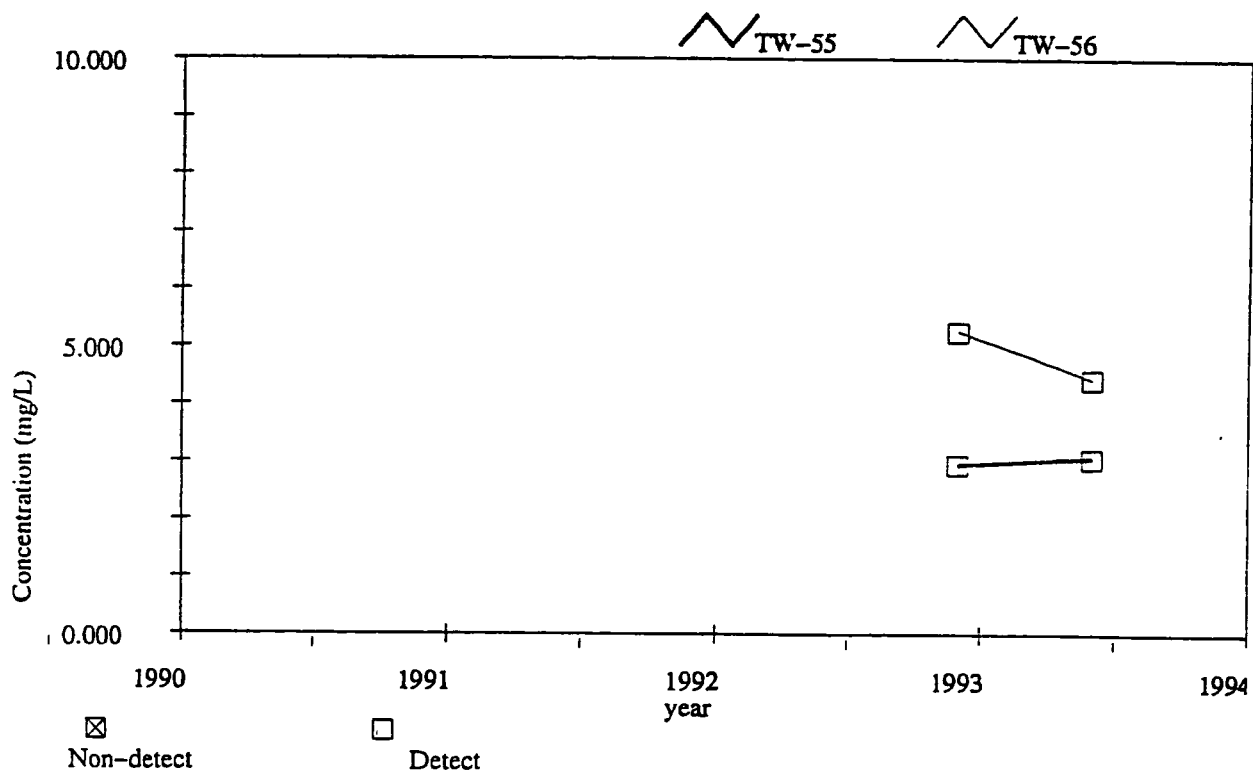


FIGURE  
Nitrate-plus-Nitrite-as-N CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II RI/ID

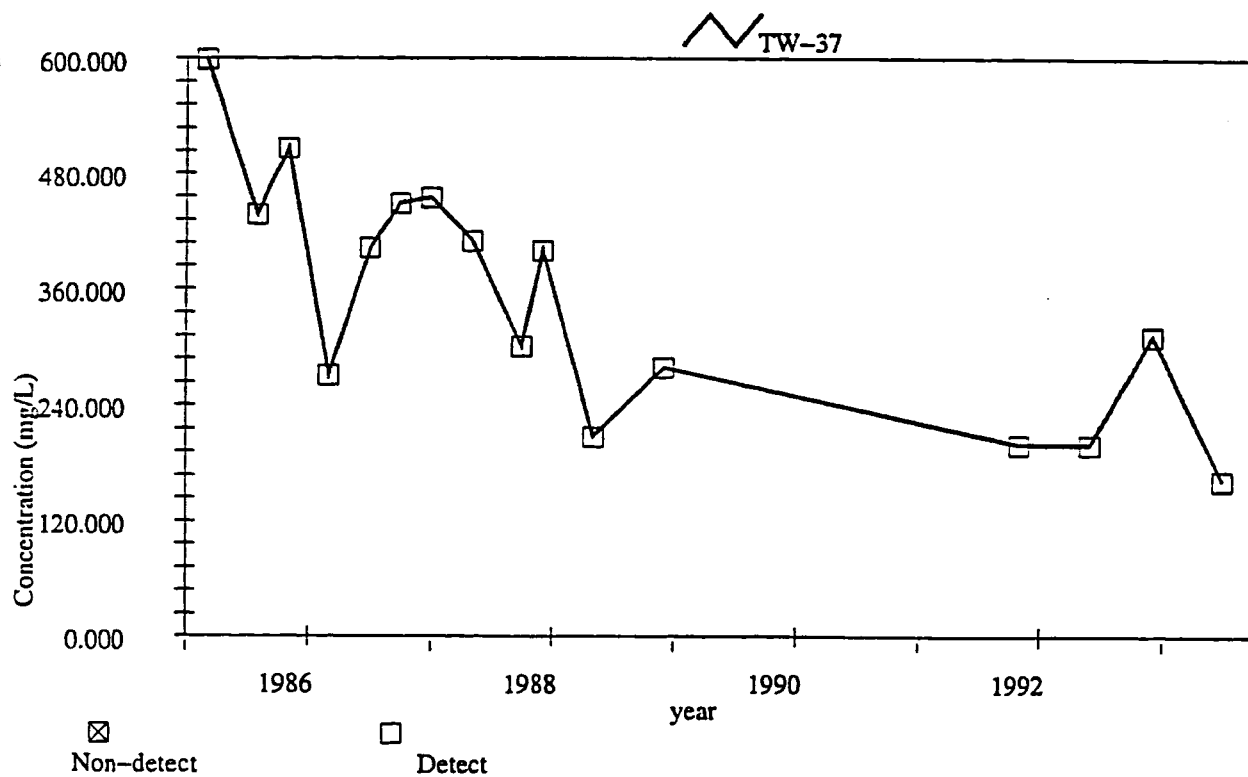


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

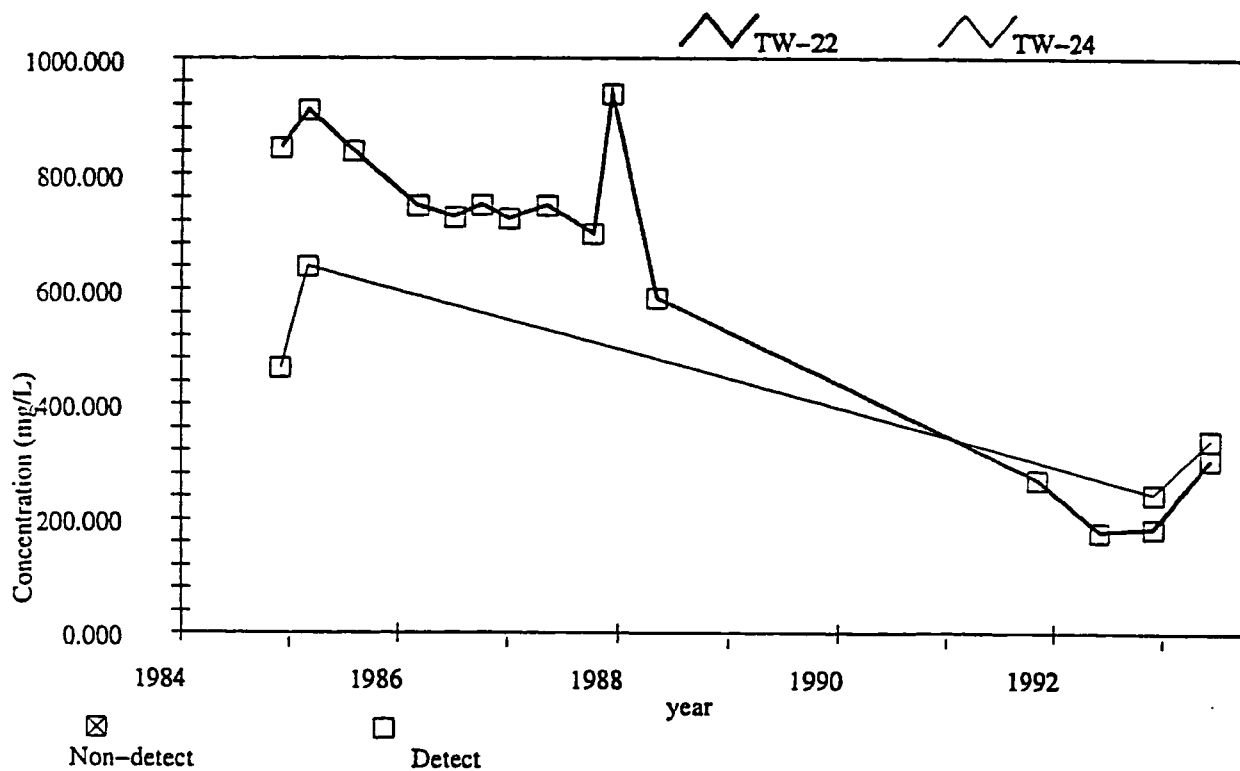


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

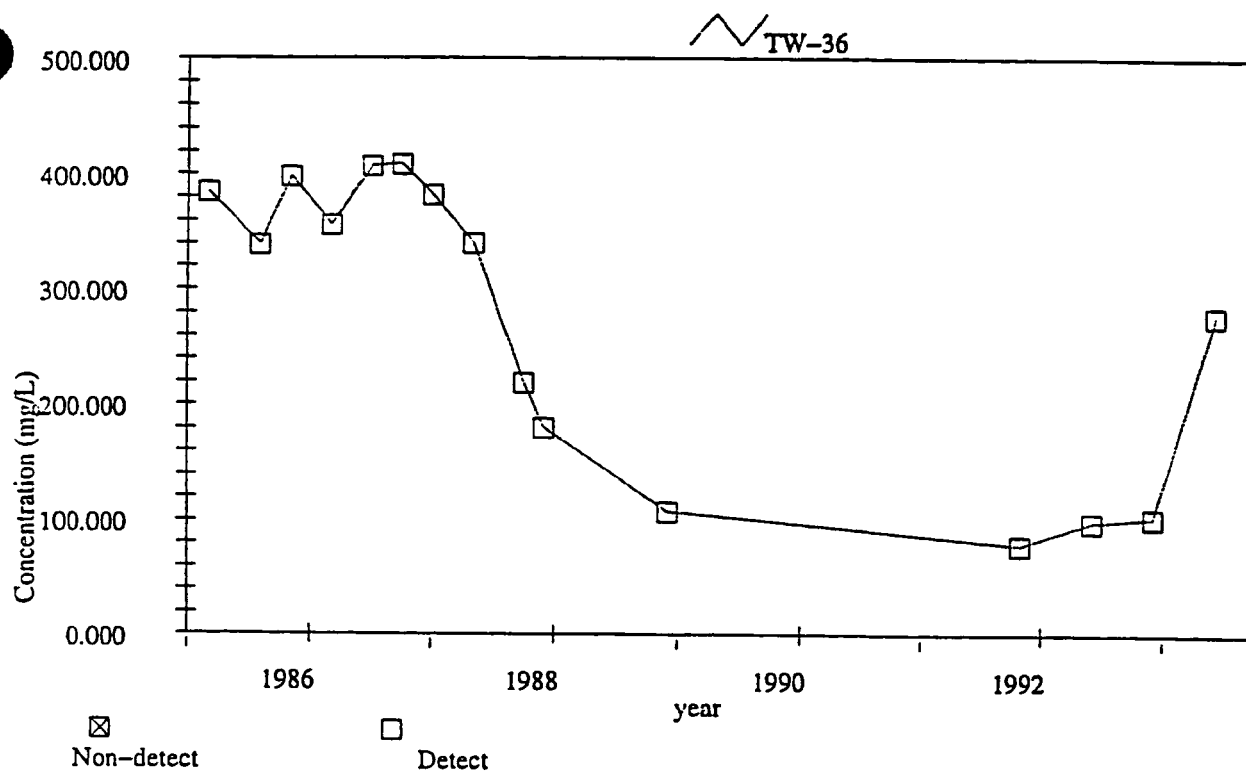


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID



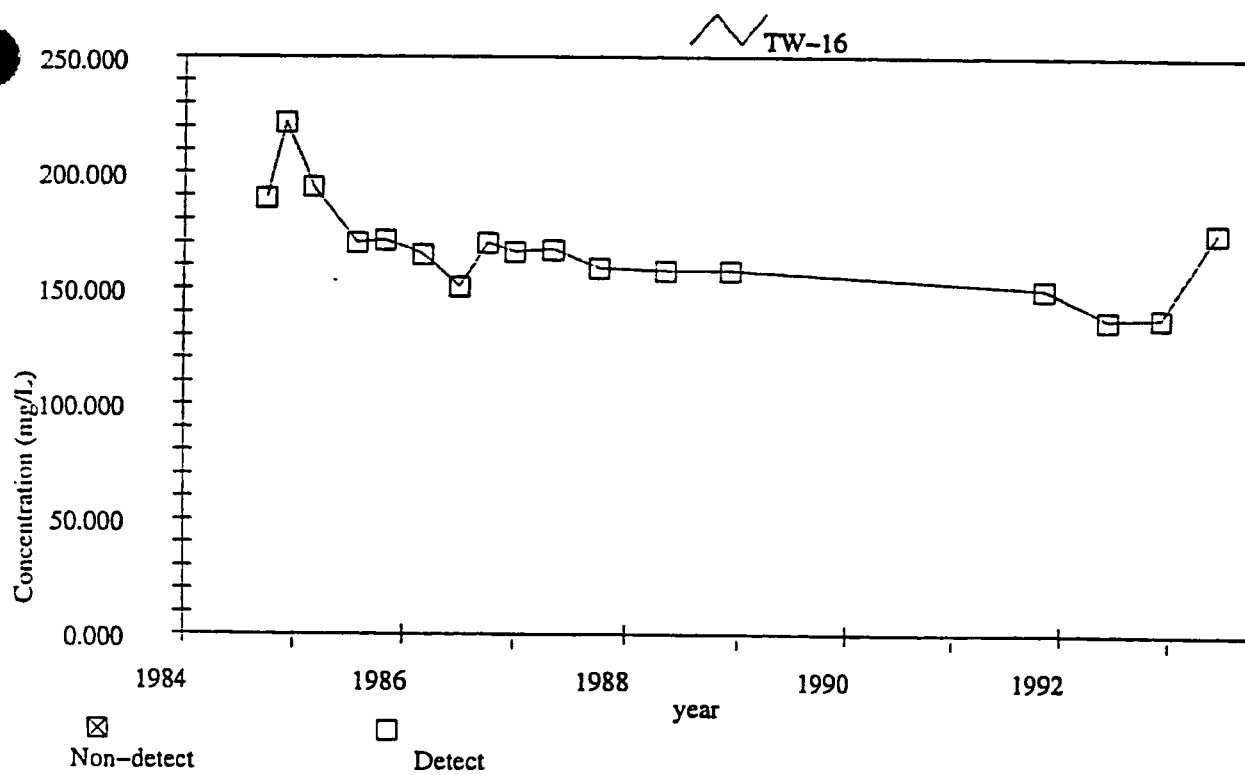


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID

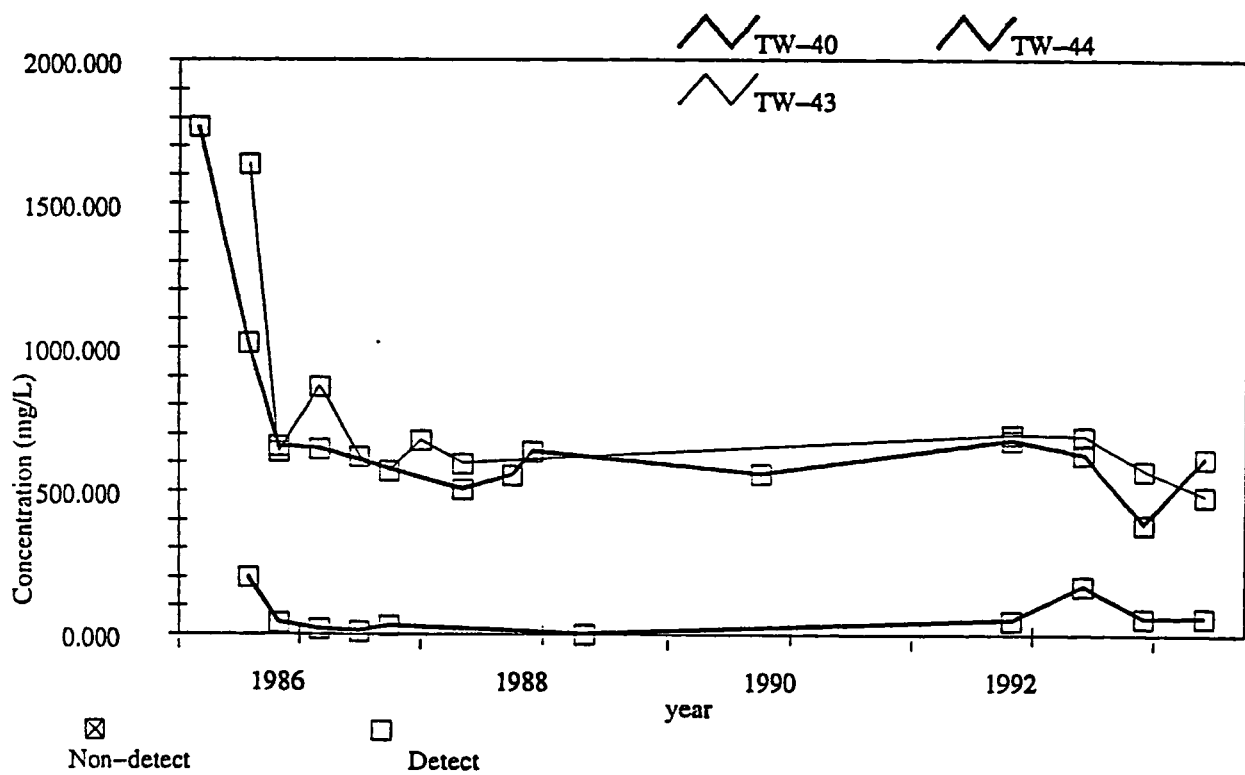


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II RI/ID

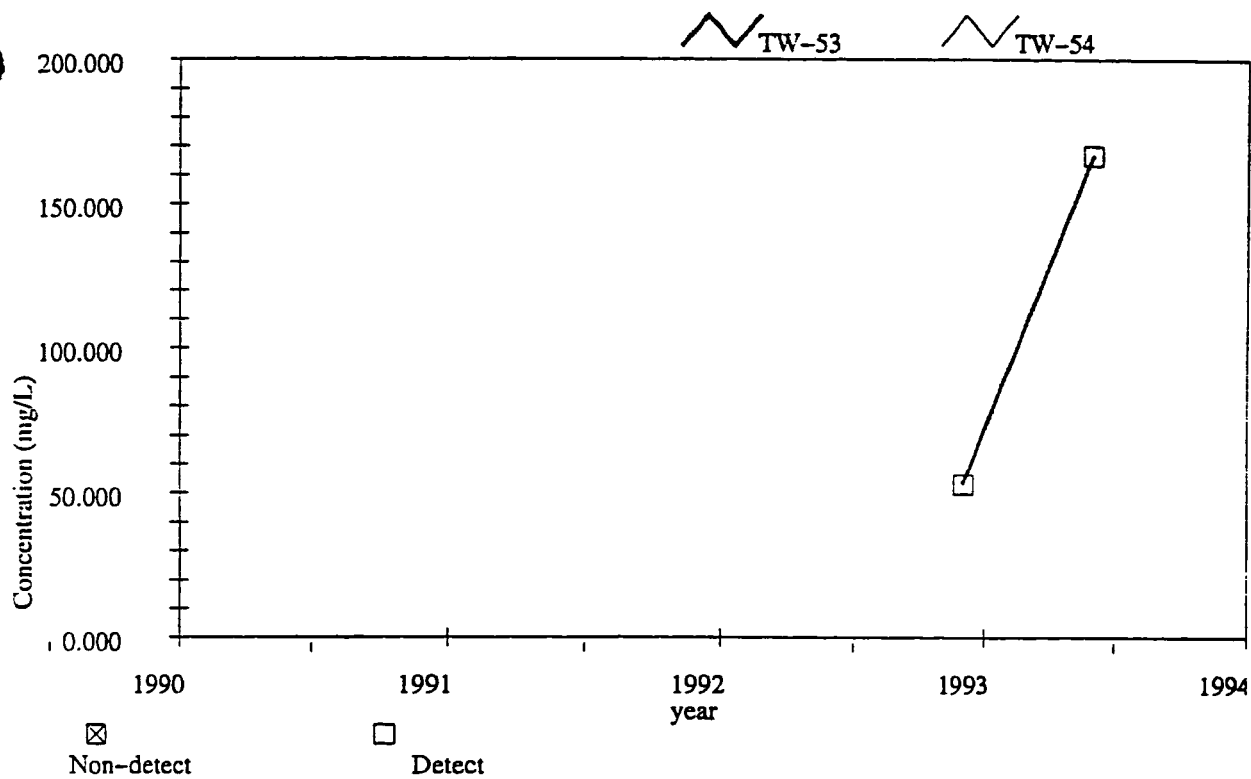


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II RI/ID

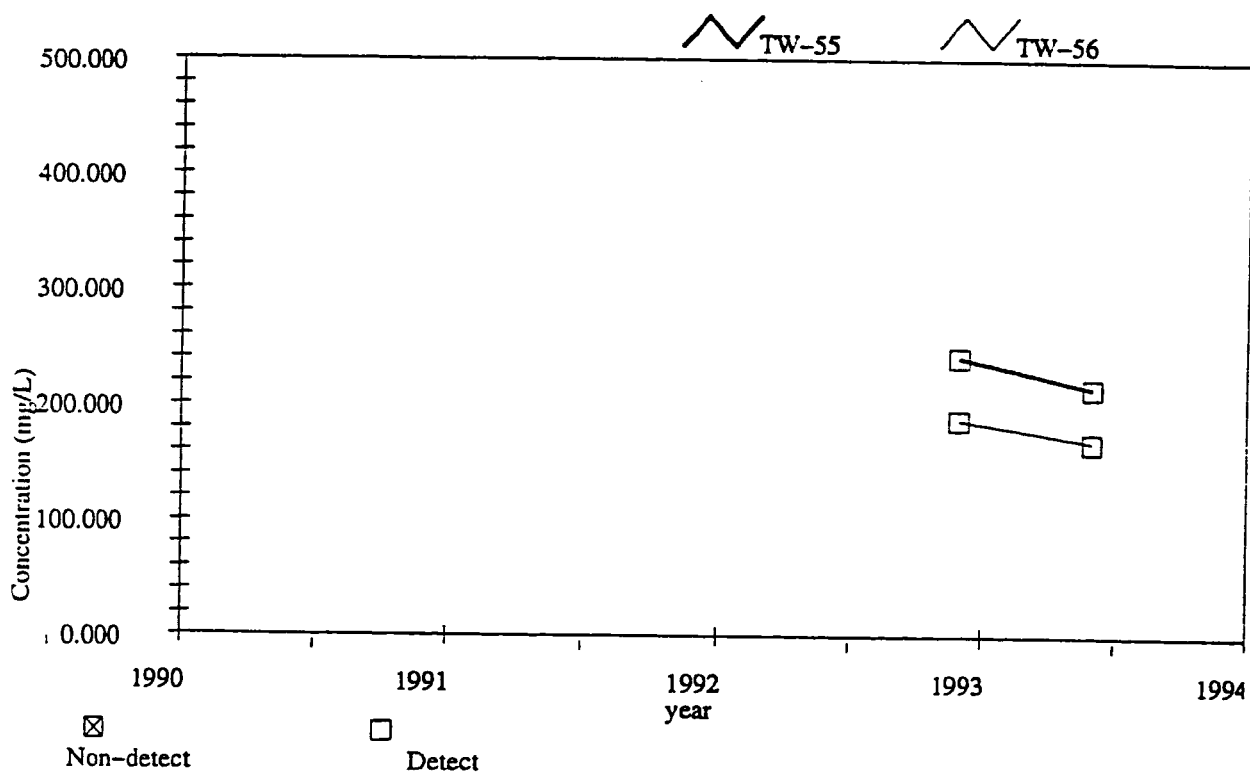


FIGURE  
Sulfate CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

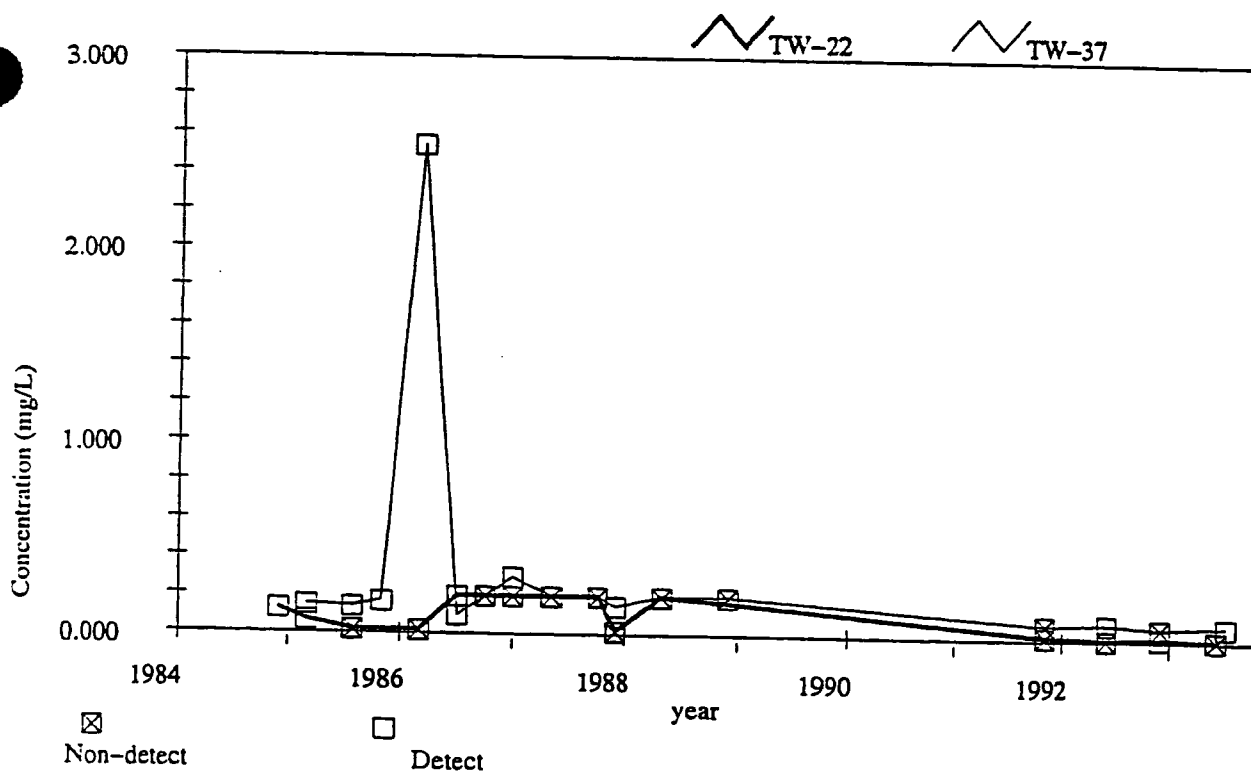


FIGURE  
Vanadium CONCENTRATION TIME HISTORY  
FOR TW-22  
MONSANTO/PHASE II R/ID

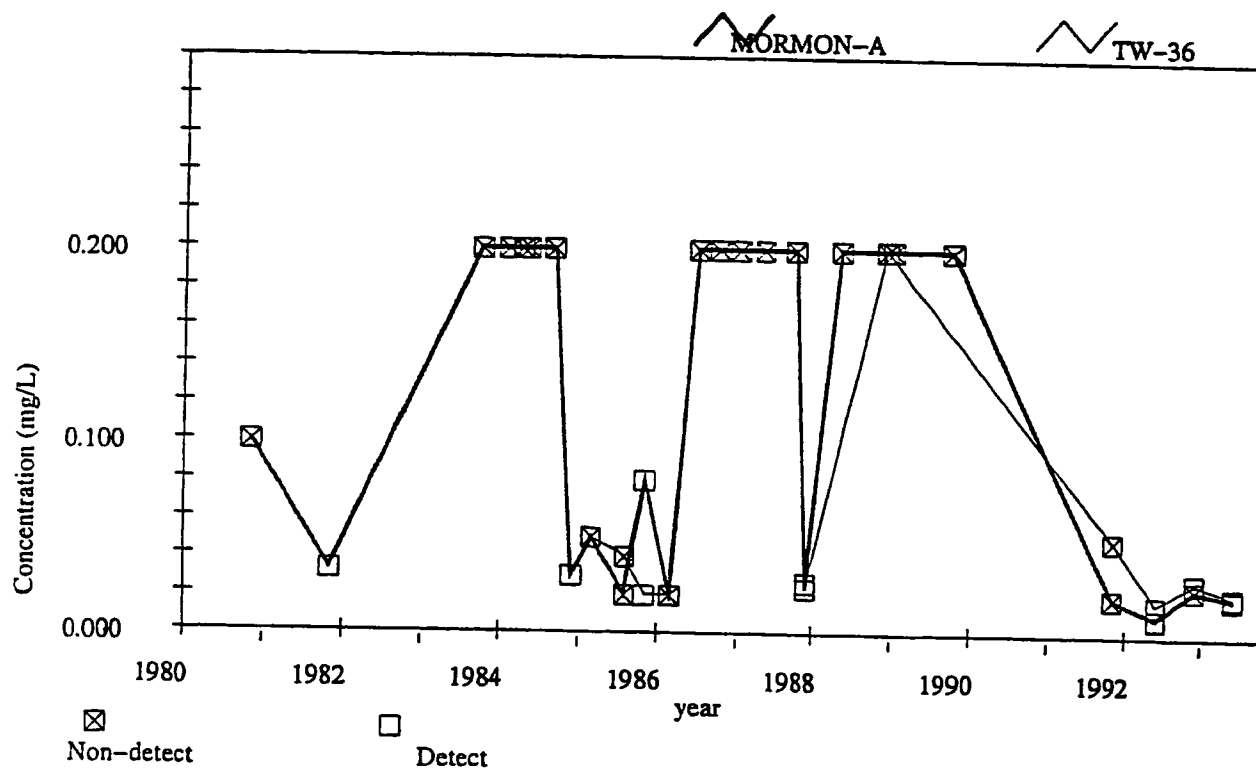


FIGURE  
Vanadium CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

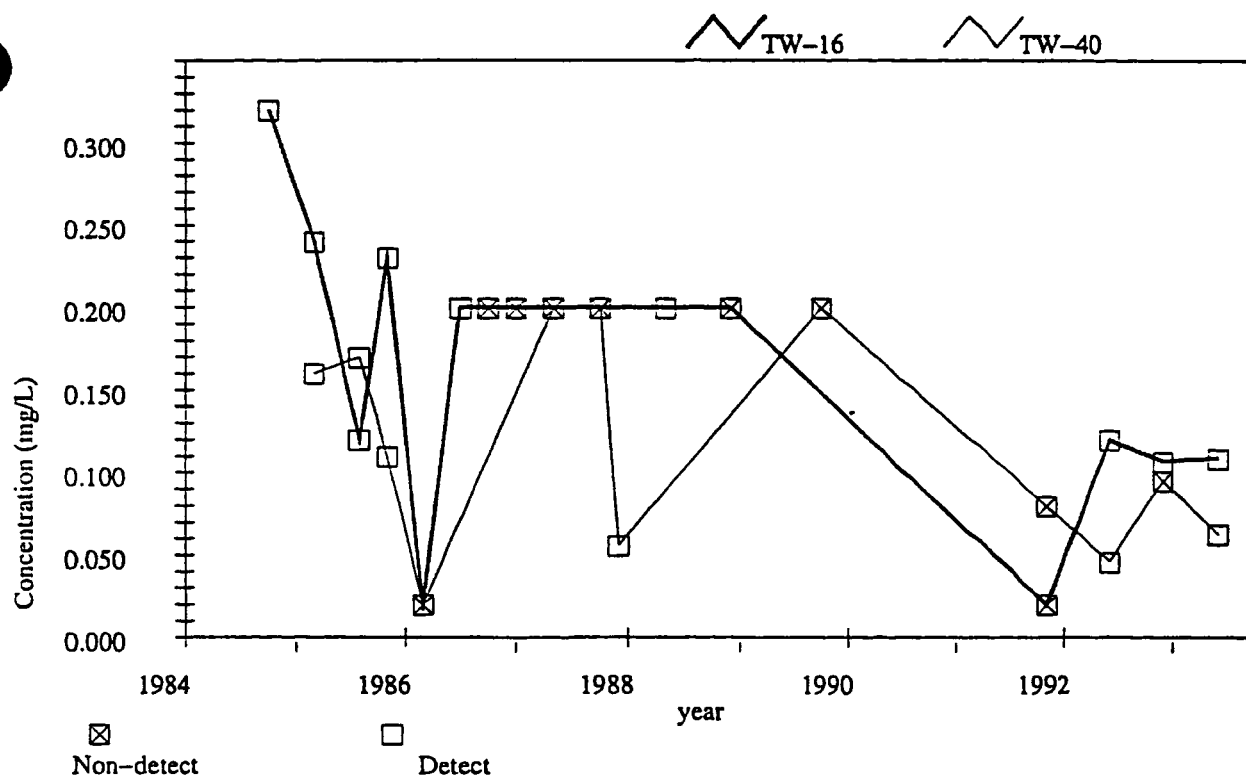


FIGURE  
Vanadium CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II R/ID



Vanadium CONCENTRATION TIME HISTORY  
FOR TW-42  
MONSANTO/PHASE II R/ID

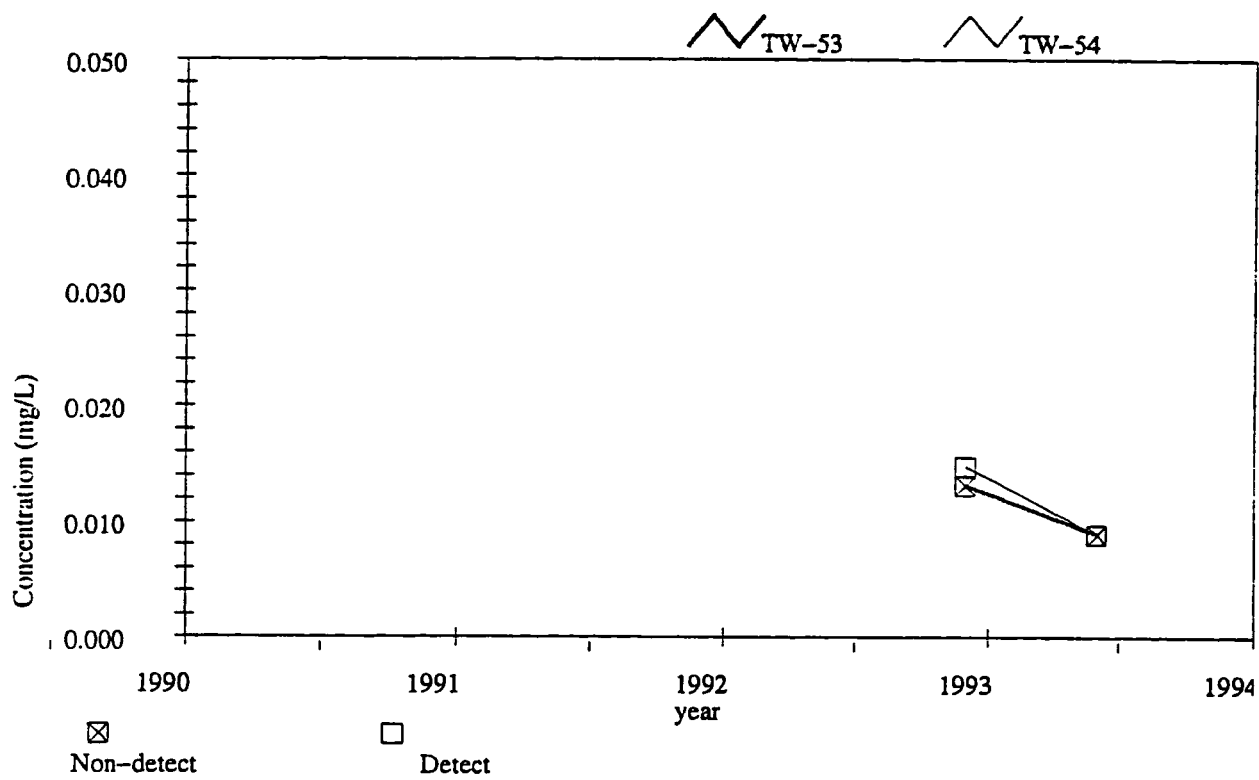


FIGURE  
Vanadium CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II RI/ID

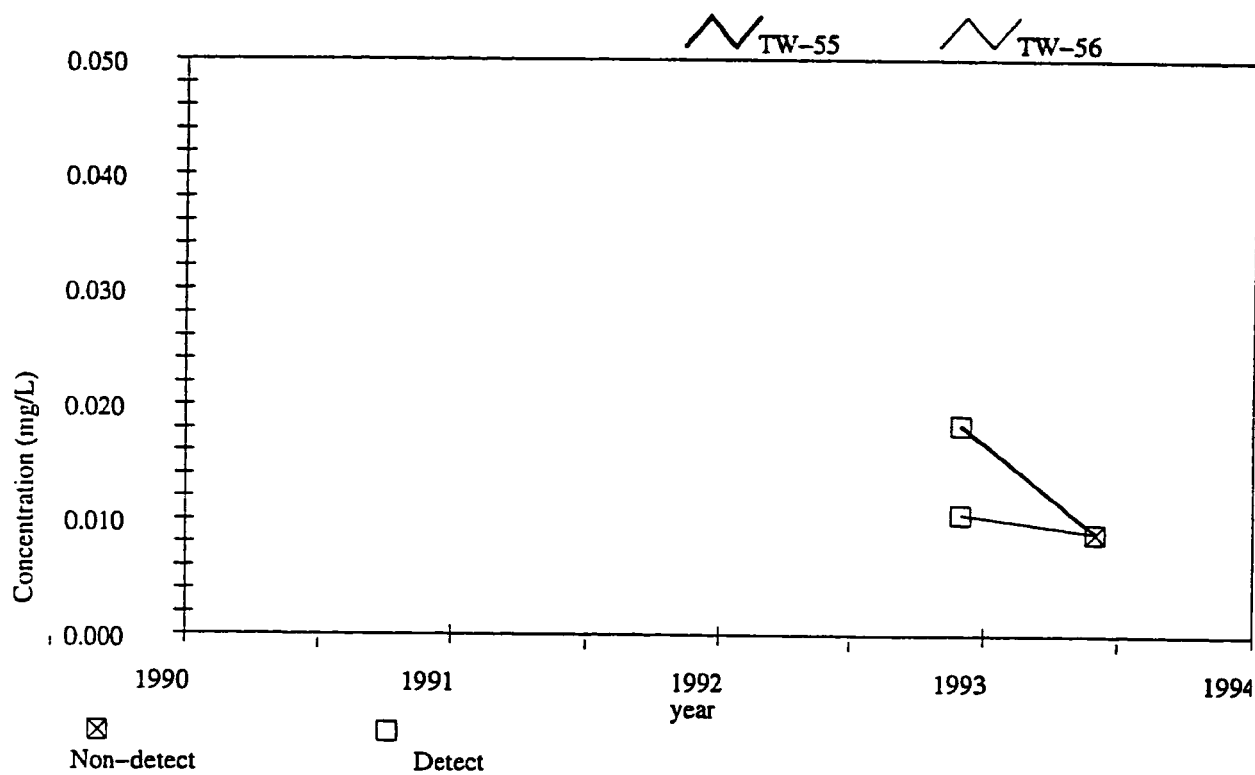


FIGURE  
Vanadium CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

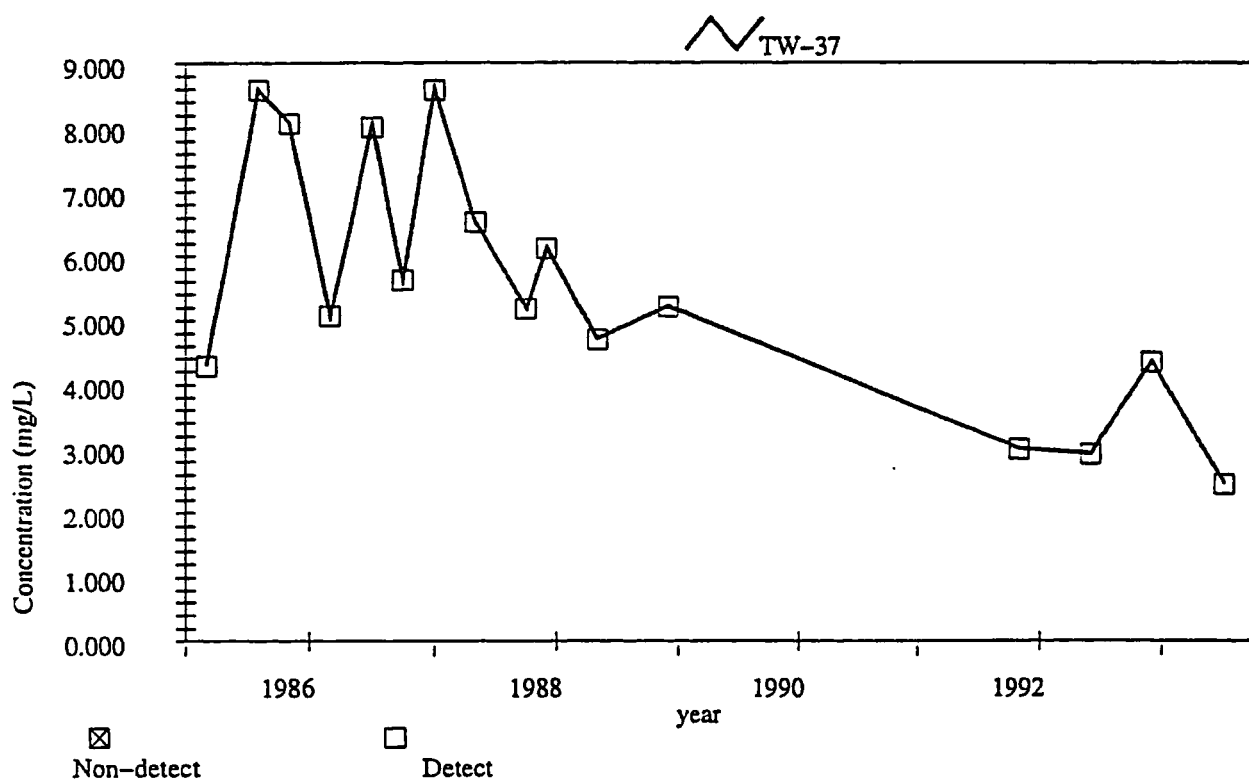


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-37  
MONSANTO/PHASE II R/ID

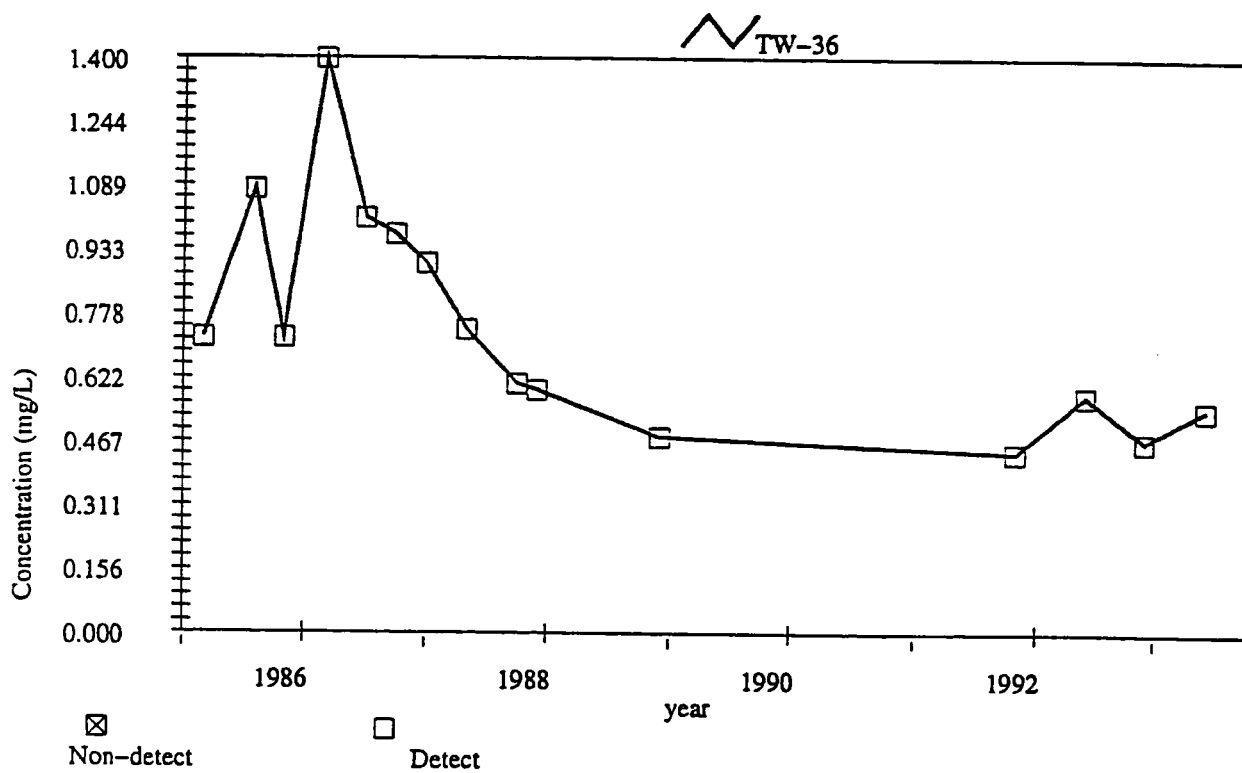


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-36  
MONSANTO/PHASE II R/ID

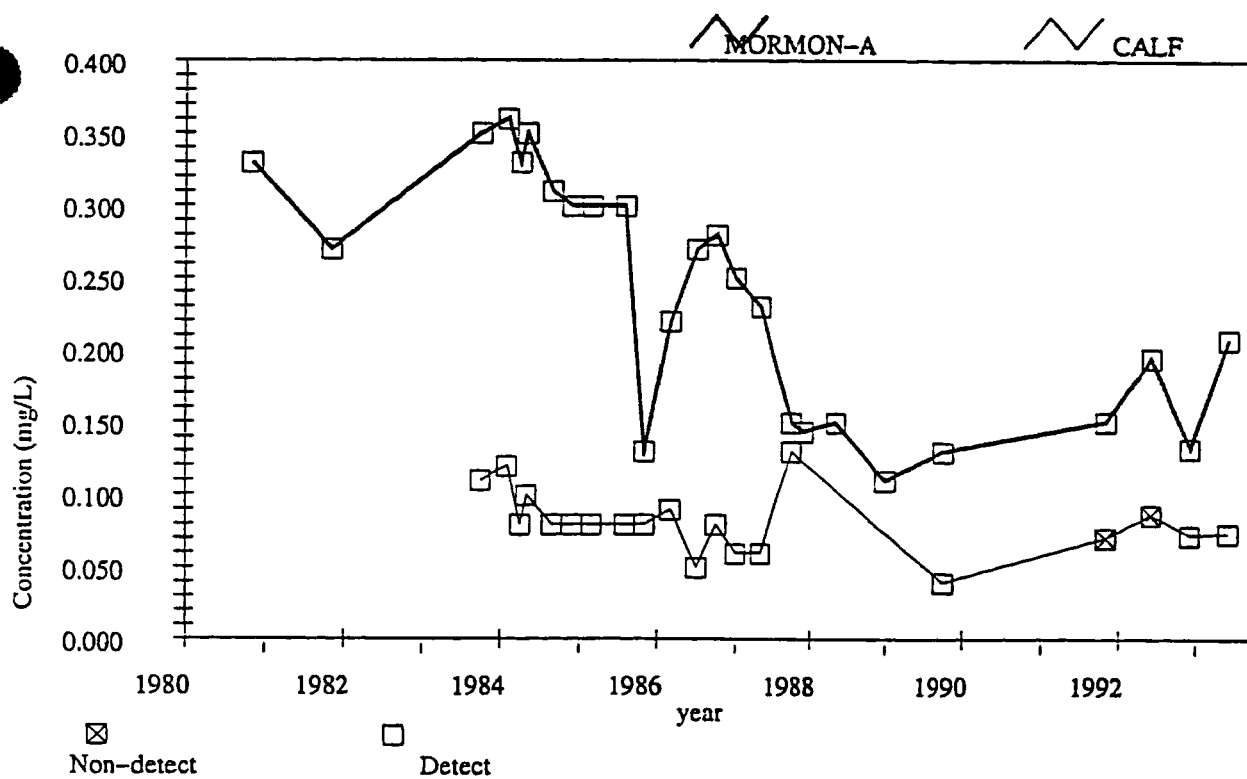


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR MORMON-A  
MONSANTO/PHASE II R/ID

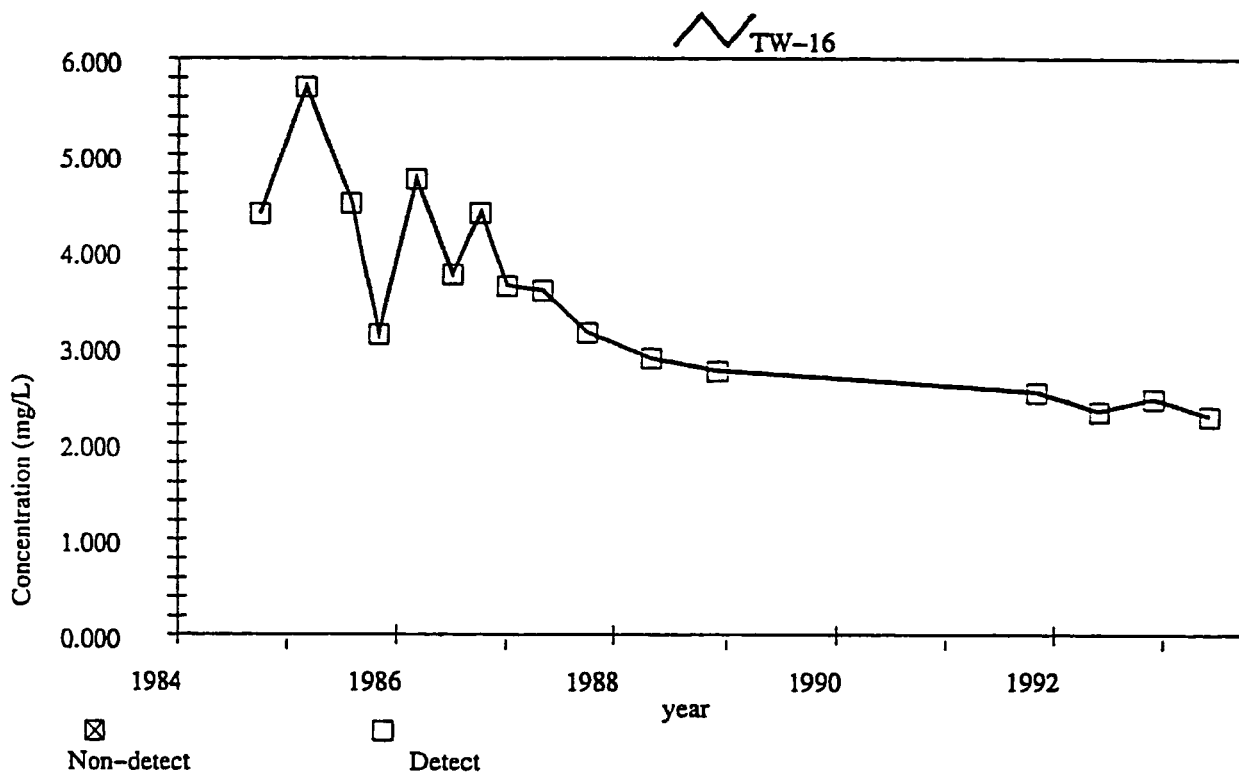


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-16  
MONSANTO/PHASE II RI/ID

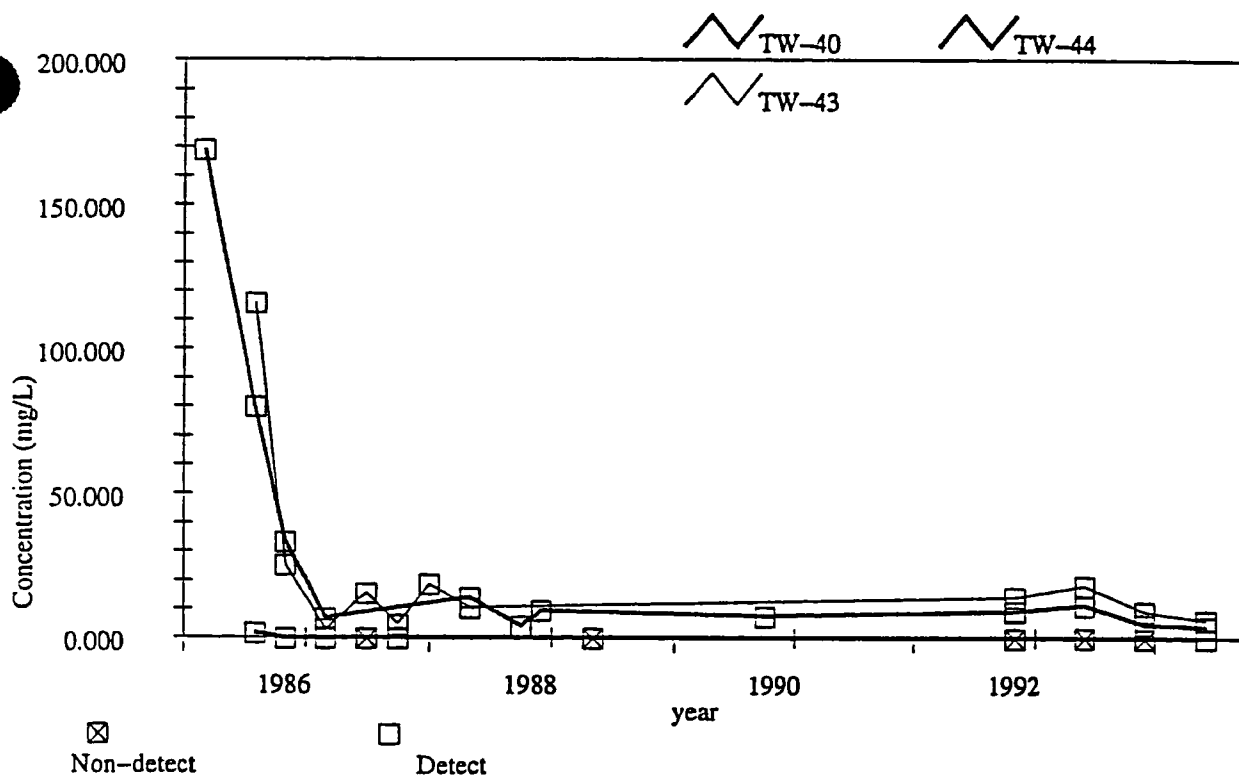


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-40  
MONSANTO/PHASE II R/ID

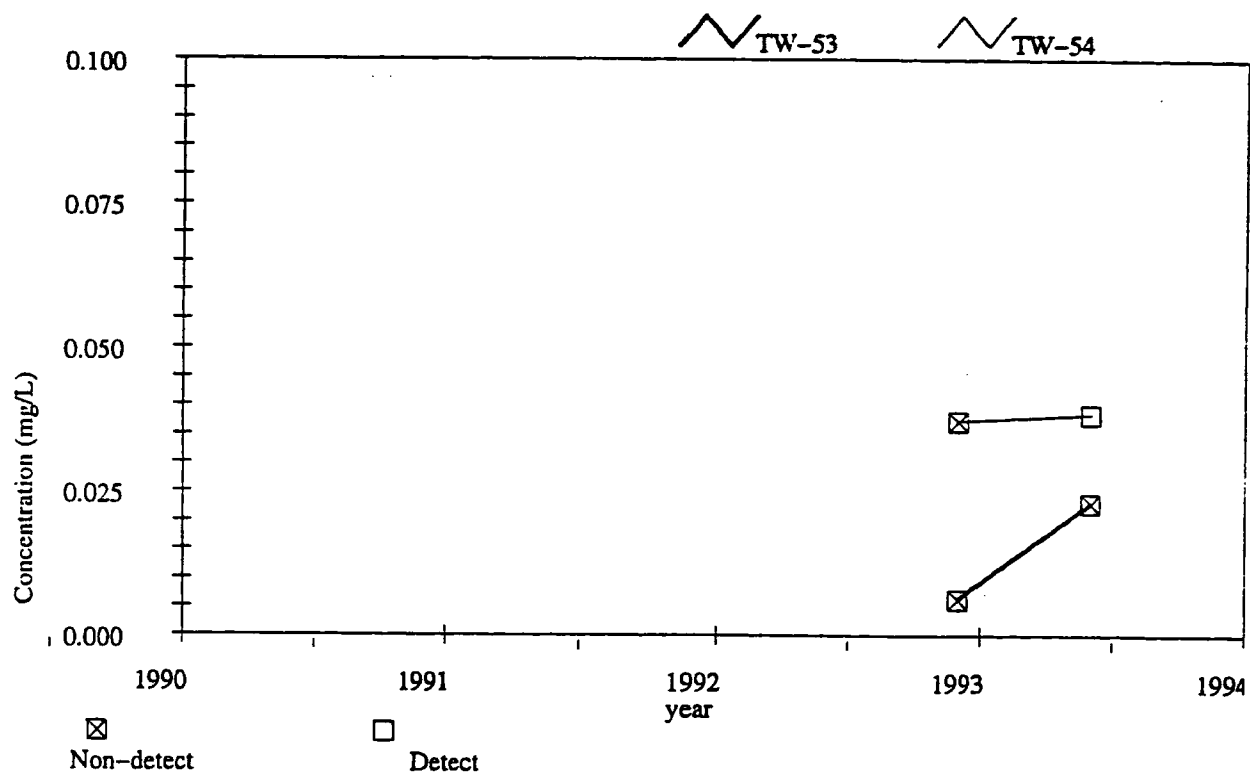


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-53  
MONSANTO/PHASE II RI/ID

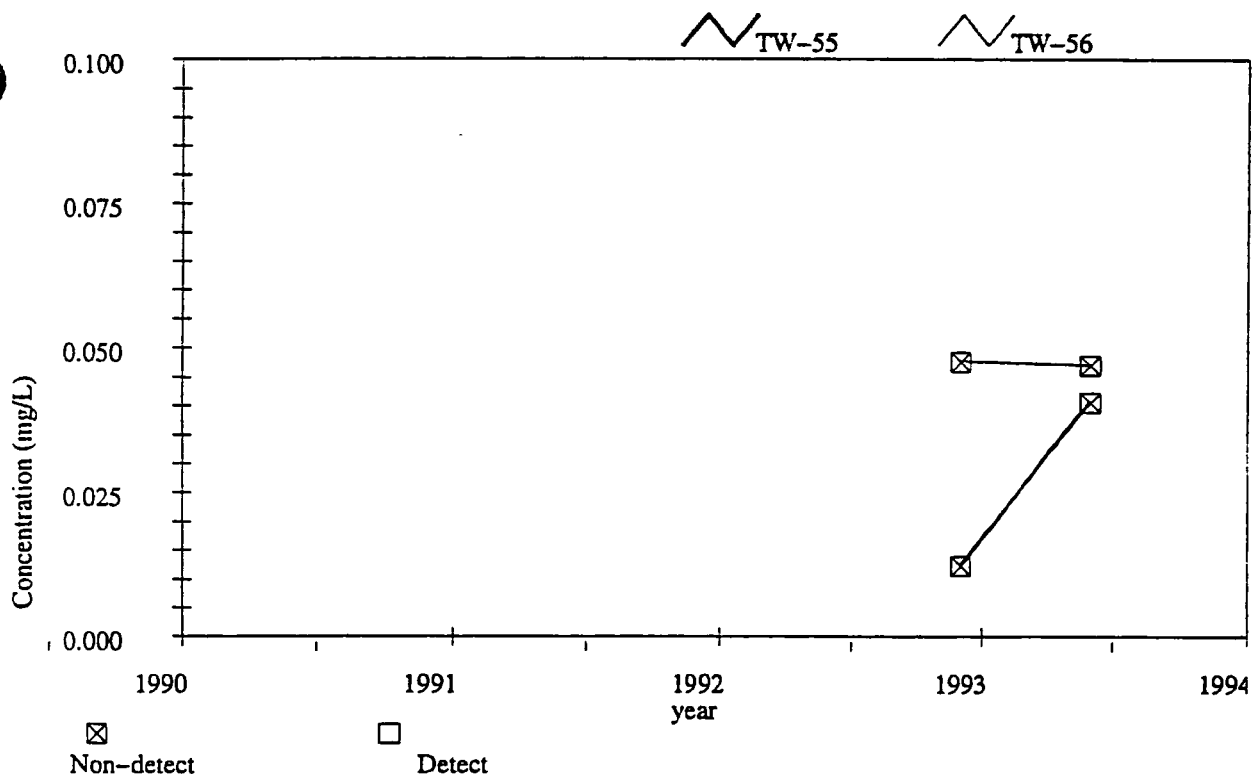


FIGURE  
Zinc CONCENTRATION TIME HISTORY  
FOR TW-55  
MONSANTO/PHASE II R/ID

APPENDIX L-4  
GEOPHYSICAL SURVEY REPORT

**Golder Associates Inc.**

4104-148th Avenue, NE  
Redmond, WA USA 98052  
Telephone (206) 883-0777  
Fax (206) 882-5498



October 12, 1992

Our ref: 913-1101.605

United States Environmental Protection Agency  
Region 10  
1200 Sixth Avenue (HW-113)  
Seattle, Washington 98101

ATTENTION: Tim Brincefield

RE: GEOPHYSICAL SURVEY REPORT FOR MONSANTO COMPANY  
SODA SPRINGS PLANT

Dear Mr. Brincefield:

Enclosed are 5 copies of our report on the recent electromagnetic survey carried out at the Monsanto Soda Springs Plant. We have located four monitoring wells based on this survey and will re-evaluate the results and interpretation of the survey after installation and sampling of these wells.

Please direct any questions regarding this report to Bob Anderson or myself.

Sincerely,

GOLDER ASSOCIATES INC.

David Banton  
Associate

DB/ca

Enclosures (5)

**Golder Associates Inc.**

4104-148th Avenue, NE  
Redmond, WA USA 98052  
Telephone (206) 883-0777  
Fax (206) 882-5498



TECHNICAL MEMORANDUM  
TO  
MONSANTO COMPANY

ON

GEOPHYSICAL SURVEY AT SODA SPRINGS PLANT  
SODA SPRINGS IDAHO

Prepared by:

Golder Associates Inc.

October 12, 1992

913-1101.605

TABLE OF CONTENTS

	<u>Page No.</u>
1. INTRODUCTION	1
2. SURVEY PROCEDURES AND METHODS	1
3. SURVEY RESULTS AND INTERPRETATION	3
4. SUMMARY AND RECOMMENDATIONS	7

LIST OF FIGURES

- 1 Location of Electromagnetic Survey Transects and Existing Wells
- 2 Map of Ground Conditions along Survey Transects
- 3 EM Conductivity Estimate Based on Ionic Water Quality
- 4 Calculated Apparent Conductivities versus TDS
- 5 Typical Vertical Dipole Response Over Vertical Offset or Dike Structure
- 6a Raw Data Plot : EM-31, Line EM-1
- 6b Raw Data Plot : EM-34, Horizontal Dipole, Line EM-1
- 6c Raw Data Plot : EM-34, Vertical Dipole, Line EM-1
- 7a Raw Data Plot : EM-31, Line EM-2
- 7b Raw Data Plot : EM-34, Horizontal Dipole, Line EM-2
- 7c Raw Data Plot : EM-34, Vertical Dipole, Line EM-2
- 8a Raw Data Plot : EM-31, Line EM-3
- 8b Raw Data Plot : EM-34, Horizontal Dipole, Line EM-3
- 8c Raw Data Plot : EM-34, Vertical Dipole, Line EM-3
- 9a Raw Data Plot : EM-31, Line EM-4
- 9b Raw Data Plot : EM-34, Horizontal Dipole, Line EM-4
- 9c Raw Data Plot : EM-34, Vertical Dipole, Line EM-4
- 10a Model EM Conductivity Profile : Line EM-1
- 10b Model EM Conductivity : Basalt B-IV, Line EM-1
- 11a Model EM Conductivity Profile : Line EM-2
- 11b Model EM Conductivity : Basalt B-IV, Line EM-2
- 12a Model EM Conductivity Profile : Line EM-3
- 12b Model EM Conductivity : Basalt B-IV, Line EM-3
- 13a Model EM Conductivity Profile : Line EM-4
- 13b Model EM Conductivity : Basalt B-IV, Line EM-4
- 14 Estimated Plume Extent and Proposed Well Locations

## 1. INTRODUCTION

An electromagnetic survey was carried out south of the Monsanto Soda Springs Plant site with the following objectives:

- To assist in selecting locations for four planned monitoring wells south of the site;
- To identify the extent of an electrically conductive plume thought to be migrating south (away from the plant site), within Basalt Flow IV (B-IV), at a depth of approximately 40 to 60 feet below ground surface; and
- To identify the presence of north-south trending fault structures south of the plant site.

## 2. SURVEY PROCEDURES AND METHODS

Four east-west survey transects were established, and surveyed at 100-foot intervals (Figure 1). Two geophysical surveys were performed along the transects using electromagnetic (EM) induction methods. Electromagnetic (EM) induction surveys are very useful for delineating the horizontal distribution of electrically conductive sediments to depths of up to 30m. Measurements were collected at a total of 170 EM-34 stations on four transects. EM instruments induce an electromagnetic field via a transmitter coil and then measure the intensity of secondary eddy currents at a receiver coil located between 3 m and 40 m from the transmitter. The intensity of the secondary field is a function of the electrical properties of the subsurface and the separation between coils. Two instruments were used for EM surveys:

- The EM-31 is a fixed-coil system with a coil separation of 3m, and an exploration depth penetration of 6 m (18 ft); and
- The EM-34 is a variable coil system with separation distances of 10 m (33 feet), 20 m (66 feet) and 40 m (131 feet), providing penetration depths up to 30 m (100 feet). The EM-34 can be used in either horizontal or vertical dipole orientations at each of the coil spacings, allowing up to six measurements per station. Horizontal and vertical dipole orientations have different depth penetration and characteristic response functions used in interpreting the measurement.

The EM-31 survey was carried out in accordance with Golder Associates Technical Procedure TP-1.1-5. The EM-31 was operated in continuous mode, such that measurements were collected at 1.3 second intervals, corresponding to approximately a five to six foot horizontal interval over the ground. Fiducial markers were digitally coded into the recorder every 100 feet for use in later processing. The EM-34 survey was carried out in accordance with Golder Associates Technical Procedure TP-1.1-6. The EM-34 was used in both vertical and horizontal dipole orientation at 10 m, 20 m, and 40 m coil separations. However, measurements from in 40 m horizontal dipole were somewhat noisy and were not collected. Noise in this configuration is not unusual due to low signal strengths at this

spacing, and high sensitivity of the measurement to coil alignment, which is more difficult to control at this spacing. In the remainder of this memorandum, references to the EM coil separations will remain in metric units, while references to station locations or depths will be in English units.

Survey conditions were generally good, with the exception of a number of barbed-wire fences which caused spikes in the EM-31 data. In addition, roads and associated power lines were excessively noisy and data gaps exist between coordinates 24+00 and 26+00 on all lines. The 40 m EM-34 coil spacing could not be used within the Monsanto Plant (Line EM-1) because of noise from the adjacent powerline. Each transect was walked and mapped (Figure 2) for significant features such as fences, ditches, sloping topography, and ground surface condition (i.e. soil or rock at ground surface).

Additional information used in the interpretation of the results included an estimate of apparent conductivity of the saturated basalt based on observed water quality in several wells located at the south portion of the site (Figure 3). Apparent conductivity was calculated based on ionic concentrations for sodium, chloride, sulfate, bicarbonate, potassium, and nitrate, utilizing ion mobilities for these constituents in the following equation:

$$s_w = 96500 * \sum C_i * M_i$$

Where

$s_w$  = Equivalent pore water conductivity (mho/m)

$C$  = Gram equivalent weight of constituent  $i$

$M_i$  = Ionic mobility of constituent  $i$

After calculating an equivalent pore-water conductivity, apparent conductivity was estimated using Archies Law:

$$s_a/s_w = n^m$$

Where

$s_a$  = Apparent conductivity of pore water and matrix

$s_w$  = Conductivity of pore water

$n$  = Porosity

$m$  = empirical constant generally between 1.5 and 2

The calculations summarized on Figure 3 were based on a porosity of 5% and an Archies constant of 1.8. Total dissolved solids (TDS), as expected, varies linearly with estimated apparent conductivity (Figure 4), indicating that no significant ions were left out of the calculation of apparent conductivity

Characteristic horizontal loop (vertical dipole) responses for a vertical offset or dike at depth were observed along several of the profiles. This response (Figure 5) is the result of the geometry between the resulting secondary fields generated in the vertical dipole orientation, and the vertical feature. The characteristic response is most obvious when the

apparent conductivity becomes negative, but any large anomalous downgoing response in the vertical dipole measurement can, in the absence of other possible explanations, be interpreted as a possible vertical offset or dike. The negative or downgoing peak is interpreted as the location of the offset or dike.

### 3. SURVEY RESULTS AND INTERPRETATION

Raw data are presented as a series of profiles (Figures 6-A,B,C through 9-A,B,C) including, for each transect:

- The EM-31 continuous mode profile - "A" Figures;
- The EM-34 horizontal dipole measurements at 10 m, and 20 m - "B" Figures; and
- The EM-34 vertical dipole measurements at 10 m, 20 m, and 40 m - "C" Figures.

The EM-31 results are the most sensitive to near surface soil conditions, and measured ground conductivities are a function of both the conductivity and thickness of the clay soil overburden. In areas where basalt is exposed at the ground surface, EM-31 conductivities are less than 3 mmho/m. Conductive overburden also affects the 10 m, 20 m, and 40 m coil measurements. In order to remove the effect of the soil overburden, a simple algebraic model was prepared, based on the response functions derived by the EM-34 manufacturer<sup>1,2</sup>. The interpretation procedure is described below.

First, an equivalent two-layer model was derived using the shallow EM-31 data only, to determine the depth of overburden. A conductivity of between 30 and 40 mmho/m was assigned to the overburden, and a value of between 1 and 3 mmho/m was assigned to the underlying unsaturated basalt, based on the observed EM-31 response over basalt outcrops. This constrained the model such that the thickness of the overburden could be calculated from the observed EM-31 data only. In areas where EM-31 conductivity was low (i.e. basalt at or near the surface), low overburden thicknesses were calculated, while higher conductivities were calculated over thicker portions of overburden.

The calculated overburden thickness was then used as the first layer thickness in a multi-layer model using similar response function calculations. The multi-layer algorithm is not a single value function, and "equivalent" combinations of input parameters (conductivity and thickness) can produce similar apparent conductivity responses. Initially, a constant "layer-cake" geometry was input corresponding to:

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<sup>1</sup> Geonics, 1981, Technical Note TN-6 : Electromagnetic Terrain Conductivity Measurement at Low Induction Numbers.

<sup>2</sup> Geonics, 1981, Technical Note TN-8, EM34-3 Survey Interpretation Techniques.

Unsaturated basalt - Layer 2 :	3 mmho/m, depth 10 to 50 feet
Saturated basalt flow top B-IV - Layer 3 :	10 mmho/m, depth 50 to 100 feet
Saturated dense basalt B-IV - Layer 4 :	5 mmho/m, below 100 feet

Conductivities of Layer 3, and in some cases Layer 4, were then varied to get the best match to the observed data. The model thicknesses for these layers represent the maximum depth of penetration for the vertical dipole coil spacings, rather than actual lithologic unit thicknesses.

Borehole information indicates that the depth to saturated basalt flow top is 40 to 50 feet in the central portion of the site, and 80 to 100 feet on the eastern edge of the site. Therefore, predicted conductivities in Layer 3 should reasonably represent conductivity in the zone of interest. The response of the EM instruments in layered systems is difficult to accurately model because of anisotropy and a non-linear response of the instrument. This is particularly true when thin layers exist with high conductivity contrasts. In highly stratified systems, an equivalent model representing approximate bulk conductivity of up to three layers is often useful for identifying interface depths or conductivity changes along a profile. It is not possible to model more than three layers over a uniform half space due to anisotropy, non-linear instrument response, and equivalence (multiple layer solutions to observed response).

The results of the model are presented in a series of three profiles for each transect (Figures 10 A,B - 13 A,B):

- "A" figures are the observed and modeled conductivities along the profile at each coil spacing; and
- "B" figures show the modeled true conductivity of Layer 3, assumed to represent the B-IV basalt layer in the central part of the site and the B-III basalt layer to the east of the main fault.

The average error of the model (model minus observed) was less than 3.5 mmho/m for all coil spacings, and generally less 1.5 mmho/m.

#### Line EM-1

Five offset responses were observed in the raw vertical dipole data at the 10 m, 20 m, or 40 m coil separations at coordinates 7+00, 16+00, 19+00, 30+00, and 35+00 (Figure 6-C). These are interpreted to represent fault offsets. Between coordinate 8+00 and 4+00, a gradual increase in conductivity is observed, with the steepest increase occurring at between coordinate 7+00 and 8+00. This location corresponds to the previously identified major fault striking southeast through the plant site. The responses at coordinate 16+00 and 19+00 do not exhibit the typical negative peak, but a downgoing response was observed at these location. Coordinate 19+00 is along the trend of the subparallel southeast trending fault identified in the southwest corner of the plant site (see Figure 1). These two structures are thought to bound the plume migrating south from the plant.

Coordinates 30+00 and 35+00 do not coincide with a previously identified structure, but exhibit strong negative peaks.

The interpreted model profile (Figure 10-A) matches the observed data reasonably well west of coordinate 26+00, but the entire length of line EM-1 could not be interpreted properly using the procedure outlined above due to a very high surface layer conductivity within the fenced area of the Plant. In order to apply the procedure outlined above, more than three layers would have been necessary. Instead, a uniform first layer thickness of 3 m was assumed, which is consistent with borehole logs at wells TW-12, TW-19 and TW-7. Layers 2 and 4 were then held constant, and Layer 3 was varied to produce the best fit to the observed data at the 10 m and 20 m coil separations. A good fit to the shallow EM-31 data was not obtained using this method. Outside the fenced area (east of coordinate 25+00), the outlined procedure was used and produced relatively good fit to the data.

Modeled conductivity in the B-IV basalt between the two easternmost structures at 7+00 and 16+00 peaks at coordinate 15+00 at about 30 mmho/m (Figure 10-B). This is consistent with the predicted conductivity based on water quality in Well TW-20.

#### Line EM-2

Four offset responses were observed in the raw vertical dipole data at the 10 m, 20 m, and 40 m coil separations at coordinate 7+00, 17+00, 19+00 and 30+00 (Figure 7-C). These are interpreted to represent fault offsets. Coordinate 7+00 is along the trend of the previously identified major fault striking southeast through the plant site. The responses at coordinates 17+00 and 19+00 do not exhibit the typical negative peak, but a downgoing response was observed at these locations. Coordinate 19+00 is along the trend of the subparallel southeast trending fault identified in the southwest corner of the plant site (see Figure 1). These two structures are thought to bound the plume migrating south from the plant. Coordinate 30+00 does not coincide with a previously identified structure.

The interpreted model profile for Line EM-2 is shown on Figure 11-A. Modeled conductivities in the B-IV basalt between the two easternmost structures at 7+00 and 17+00 peak at coordinate 15+00 at about 30 mmho/m (Figure 11-B). This is consistent with the estimated conductivity based on water quality at well TW-20. Near background conductivities are observed at coordinate 10+00 and 17+00. These are interpreted to be the bounding coordinates of the plume. Soils are present between these structures which cause an increase in shallow EM-31 conductivities. Maximum thickness of the soils is estimated at about 3 m (10 feet). The three-layer model solution is only approximate in this area, as indicated by difficulty in matching the responses of the 10 m, and 20 m coils. This is likely due to a relatively thin high conductivity layer between 15 m (45 feet) and 30 m (90 feet) depth. Conductivities east of the fault at 5+00 are slightly higher than those observed at coordinate 15+00, and similar responses are observed at both the 10 m and 20 m coil separations. This is interpreted to be due to a more extensive high conductivity plume (originating east of the Monsanto Plant) below a depth of 15 m (45 feet), and east of coordinate 7+00.

Thicker clay soils west of coordinate 25+00 cause variations in conductivity at all coil spacings. Unlike the plume area around coordinate 15+00, an approximate fit can be obtained using a three-layer model with clay soil thicknesses of up to 7 m (23 feet). West of coordinate 30+00 (interpreted as a possible offset) conductivities increase to about 30 mmho/m. This is somewhat higher than estimated conductivities calculated based on water quality at Calf and Mormon spring. Because the response can be approximated using a three-layer model, the observed conductivities are interpreted to be the result of natural high TDS soda water distributed uniformly throughout the basalt.

#### Line EM-3

Four offset responses were observed at the 10 m, 20 m, and 40 m coil separations at coordinates 6+00, 18+00, and 34+00 and 36+00 (Figure 8-C). These are interpreted to represent fault offsets. Coordinate 6+00 is along the trend of the previously identified major fault striking southeast through the plant site, and is consistent with the EM responses on lines EM-1 and EM-2. The response at coordinate 18+00 shows a negative peak at the 40 m coil separation and a downgoing response at the other coil spacings. Coordinate 18+00 is along the trend of the subparallel southeast trending fault identified in the southwest corner of the plant site (see Figure 1), and is consistent with observed responses on line EM-1 and EM-2.

The interpreted model profile for Line EM-3 is shown on Figure 12-A. The interpreted true conductivity of the B-IV basalt increases above background (10 mmho/m) between coordinates 10+00 and 20+00, with a peak of 20 mmho/m at coordinate 17+00 (Figure 12-B). This area may represent the leading edge of the plume, with comparatively better water quality than along line EM-2. Soils are present between the faults at 6+00 and 18+00 and cause an increase in shallow EM-31 conductivities. Maximum thickness of the soils is estimated at nearly 5 m (16 feet). The three-layer model solution is not sufficient to predict apparent conductivities at all coil spacings, suggesting a relatively thin high conductivity layer, similar to the observations on Line EM-2. Conductivities east of the fault at 6+00 increase slightly, but a reasonable model fit is obtained without increasing the conductivity of the basalt. Thus, there is little evidence of a plume east of the major fault along this line.

Offset responses observed at coordinates 34+00 and 36+00 do not coincide with previously identified structures, but are consistent with observed responses on line EM-1 and EM-2, suggesting two structures trending north-northwest. Thicker clay soils east of the road cause variations in conductivity at all coil spacings. Similar to previous lines, an approximate fit can be obtained using a three-layer model with clay soil thicknesses of up to 10 m (33 feet). Modeled conductivity in the B-IV is relatively constant near a background of about 10 mmho/m.

#### Line EM-4

Three offset responses were observed at the 10 m, 20 m, and 40 m coil separations at coordinates 5+00, 10+00, and 35+00 (Figure 9-C). These are interpreted to represent fault offsets. Coordinate 5+00 is along the trend of the previously identified major fault striking

southeast through the plant site, and is consistent with the EM responses on lines EM-1, EM-2, and EM-3. The response at coordinate 10+00 shows a negative peak at the 20 m and 40 m coil separation and a downgoing response at the other coil spacings. Coordinate 10+00 does not coincide with any previously identified structures and similar responses are not observed in this area on the other EM lines. No offset response was observed along the trend of the subparallel southeast trending fault identified in the southwest corner of the plant site (see Figure 1).

The interpreted model profile for line EM-4 is shown on Figure 13-A. Modeled conductivities in the B-IV basalt are near background throughout the line (Figure 13-B). These results indicate that the plume may not have reached this far south and that background water quality could be expected in this area. Soils are present throughout the line, causing an increase in shallow EM-31 conductivities. Maximum thickness of the soils is estimated at between 2 m and 5 m (6 to 16 feet). A thicker soil is modeled along the Little Spring Creek drainage. The three-layer model solution is reasonable on this line, indicating uniform layer conductivities. Apparent conductivities east of the fault increase slightly, but it is not possible to interpret a more extensive high conductivity layer on this side of the fault.

The offset response observed at coordinate 35+00 does not coincide with a previously identified structure, but is consistent with observed responses on lines EM-1, EM-2, and EM-3 suggesting a structure trending north-northwest. Thicker clay soils east of the road cause variations in conductivity at all coil spacings. Similar to previous lines, an approximate fit can be obtained using a three-layer model with clay soil thicknesses of up to 10 m. Modeled conductivity in the B-IV is relatively constant in this area at between 5 and 10 mmho/m.

#### 4. SUMMARY AND RECOMMENDATIONS

Figure 14 shows the interpreted extent of structures, plume(s) and background apparent conductivity based on the EM survey. Recommended monitoring well locations are also noted on the Figures. The results of the survey are summarized below, with separate summaries for areas east and west of the road at station 25+00.

West of station 25+00, variably thick clay soils cause variations in observed conductivity at all coil spacings. Based on the EM-31 measurements, the thickness of these soils range from 1 to 10 m. The conductivity of unsaturated basalt is estimated at about 3 to 5 mmho/m based on measurements over areas where basalt is exposed at the surface. Modeled conductivities within the underlying saturated basalt in this area appear to decrease southward, from about 30 mmho/m on line EM-1 to about 5 mmho/m on lines EM-3 and EM-4. The decreasing conductivity southward could be due to deeper groundwater levels, lower TDS groundwater, or both. The ability to approximately match the observed responses using a simple three-layer model with variable overburden thickness suggests that conductivity in the basalt is likely due to natural groundwater, distributed uniformly within the basalts. One previously unidentified north trending

structures may exist in this area, based on a characteristic horizontal loop (vertical dipole) response. This structure can be correlated between lines.

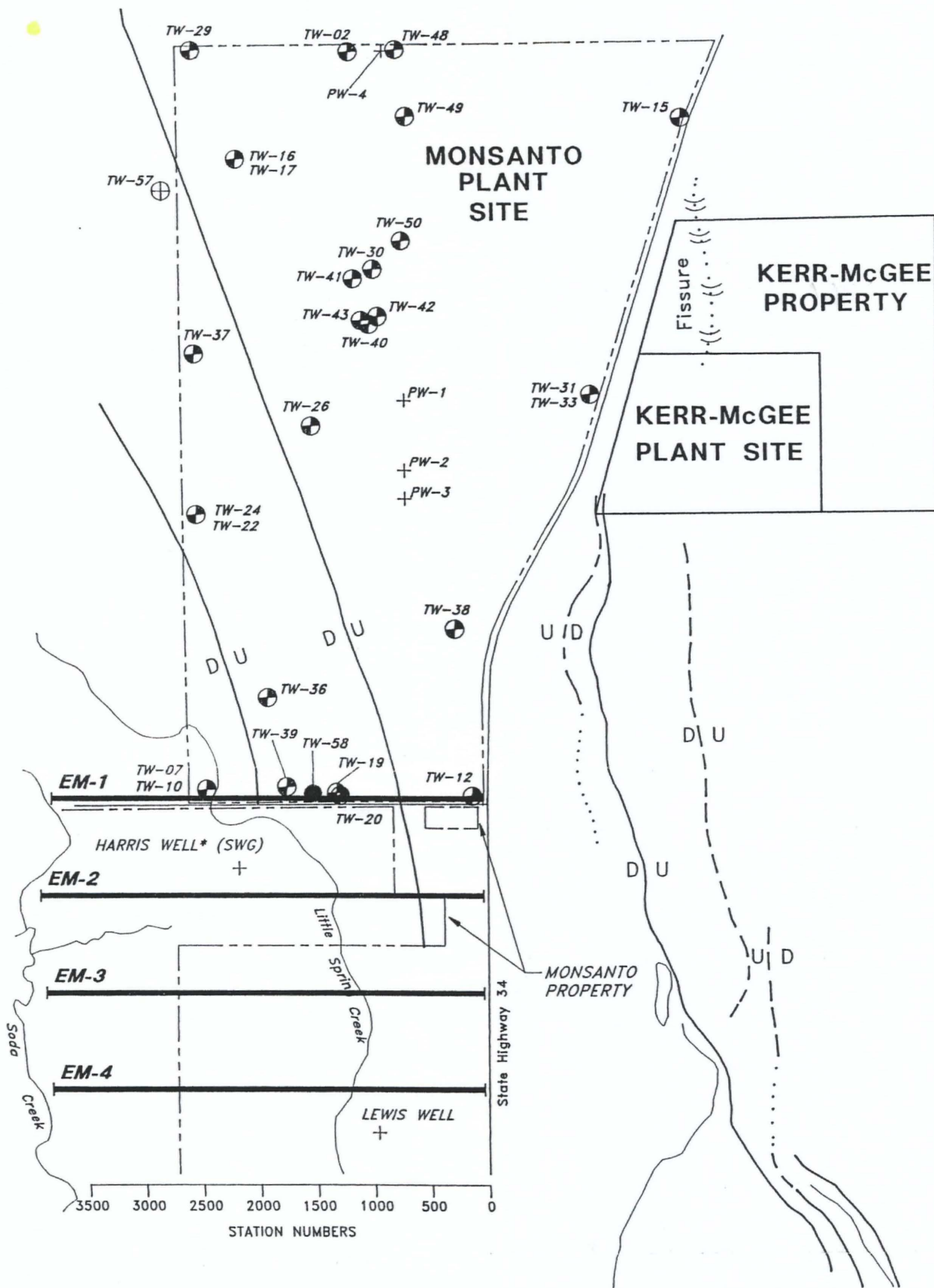
The major fault identified within the Monsanto Plant site can be observed in all profiles near coordinate 5+00 for a total distance of 1,950 feet south of the Plant site. The secondary sub-parallel fault to the west can be identified only in the first three profiles near coordinate 18+00 for a minimum extent of 1,300 feet south of the Plant site. Thin clay soils cause variations primarily in the EM-31 measurements and cannot account for observed conductivity variations at larger coil spacings. Conductivity changes are therefore present in the underlying saturated basalt between 15 m (45 feet) and 30 m (90 feet). A plume of elevated conductivity groundwater appears to be present between the subsidiary fault and the major fault with a maximum extent of between 650 and 1,300 feet south of the fenced plant area. The 1,300-foot distance probably represents the leading edge of the plume, which has a conductivity about two times background levels. The 650-foot distance represents the minimum distance of the "core" of the plume with conductivity about three times greater than background. The elevated conductivity appears to be localized within a relatively thin zone, based on the relative responses at various coil spacings. This is consistent with previous interpretations of the hydrogeology. A more uniform distribution of elevated conductivity groundwater would produce similar responses at all coil spacings. A distinct and separate area of elevated conductivity is present on the east side of the main fault, near State Highway 34, on line EM-2. A distinct conductivity contrast is not well defined on the two southerly profiles (EM-3 and EM-4). The area east of the main fault has a higher conductivity and appears to be more vertically extensive based on similar apparent conductivities at increasing coil spacing.

Based on the survey, the following borehole locations are recommended and are shown on Figure 14:

- TW-53 Line EM-2 coordinate 20+00. Located west of the subsidiary fault;
- TW-54: Line EM-2 coordinate 15+00. Located in the core of the fault bounded plume;
- TW-55: Line EM-2 coordinate 10+00. Located on the eastern edge of the fault bounded plume, but west of the main fault; and
- TW-56: Line EM-2 coordinate 3+50. Located on the east side of the main fault near Highway 34.

Once the boreholes have been drilled, and groundwater samples collected, a re-evaluation of the geophysical survey will be performed to refine the interpretation of the hydrogeology south of the Plant site.

## FIGURES



#### Legend

- Electromagnetic survey transect
- + Existing production well
- ⊗ Existing monitoring well
- ⊕ Proposed monitoring well
- Proposed test well
- \* Currently not in use

#### NOTE:

PW-1, PW-2, PW-3, PW-4 and TW-2 are open to both the Upper and Lower Basalt Zones.

FIGURE 1  
LOCATIONS OF ELECTROMAGNETIC SURVEY  
TRANSECTS AND EXISTING WELLS  
MONSANTO/GEOPHYSICS/ID

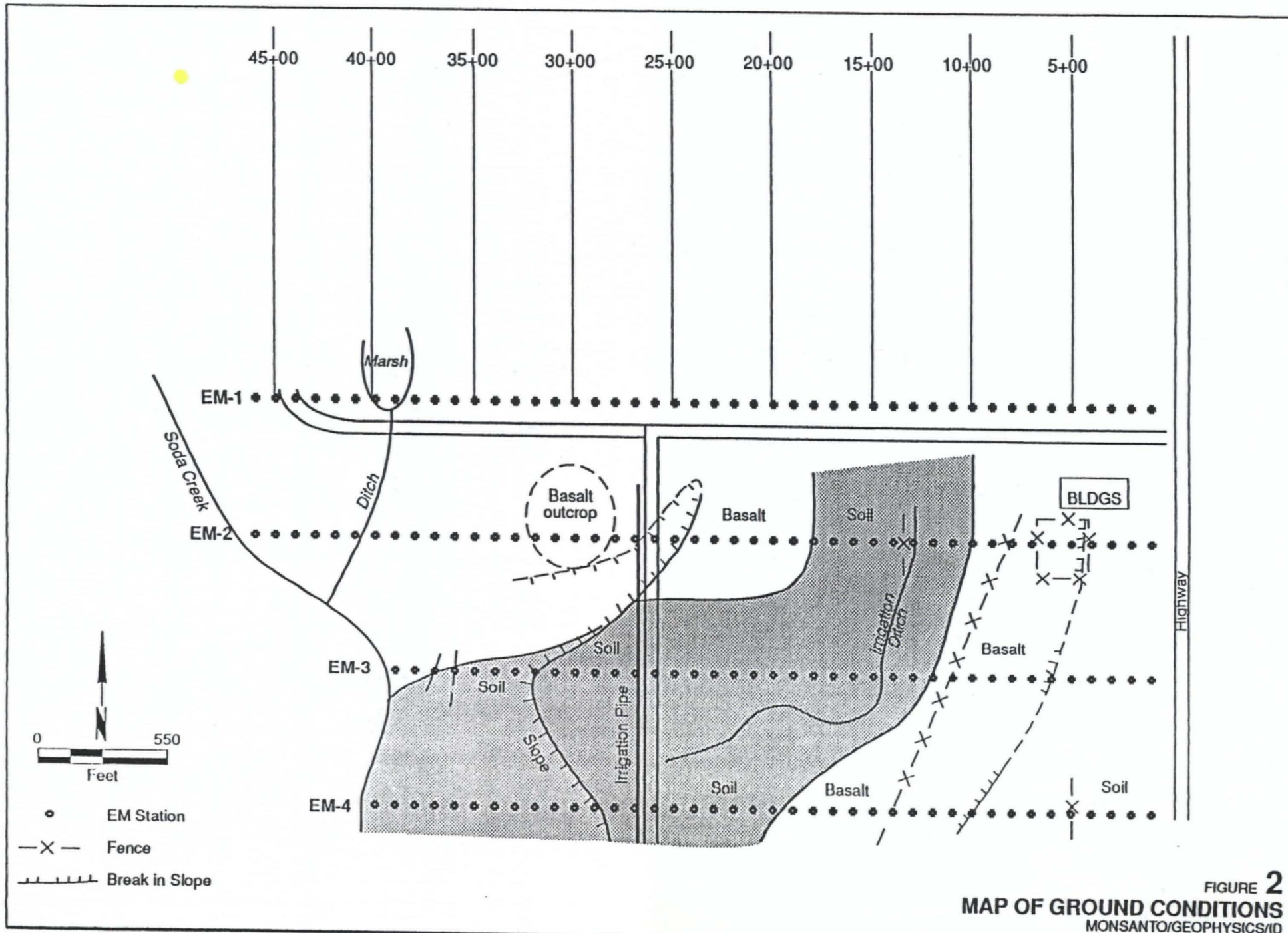


FIGURE 2  
**MAP OF GROUND CONDITIONS**  
 MONSANTO/GEOPHYSICS/ID

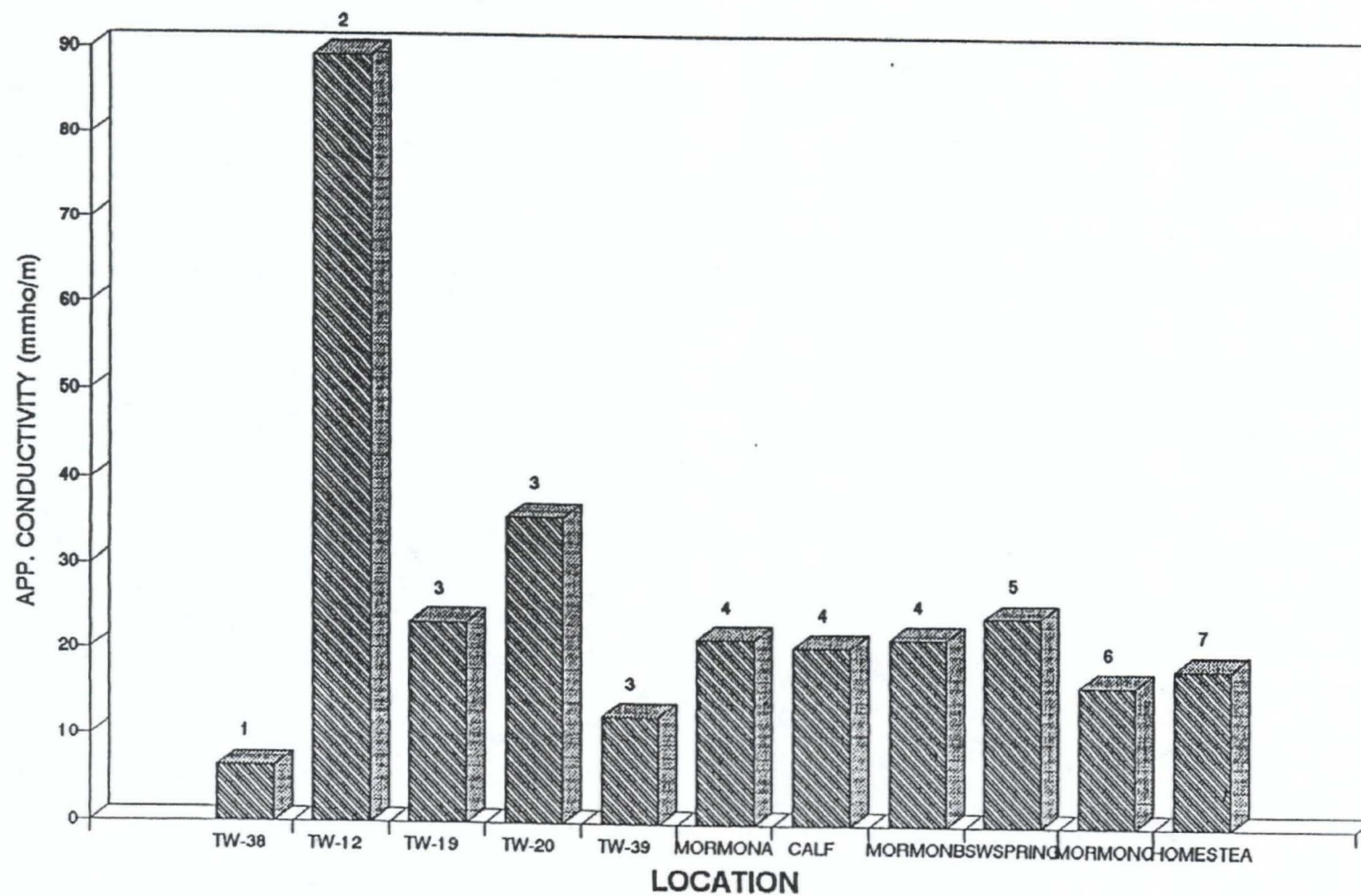


FIGURE 3  
 EM CONDUCTIVITY ESTIMATE  
 BASED ON IONIC WATER QUALITY  
 MONSANTO/GEOPHYSICS/ID

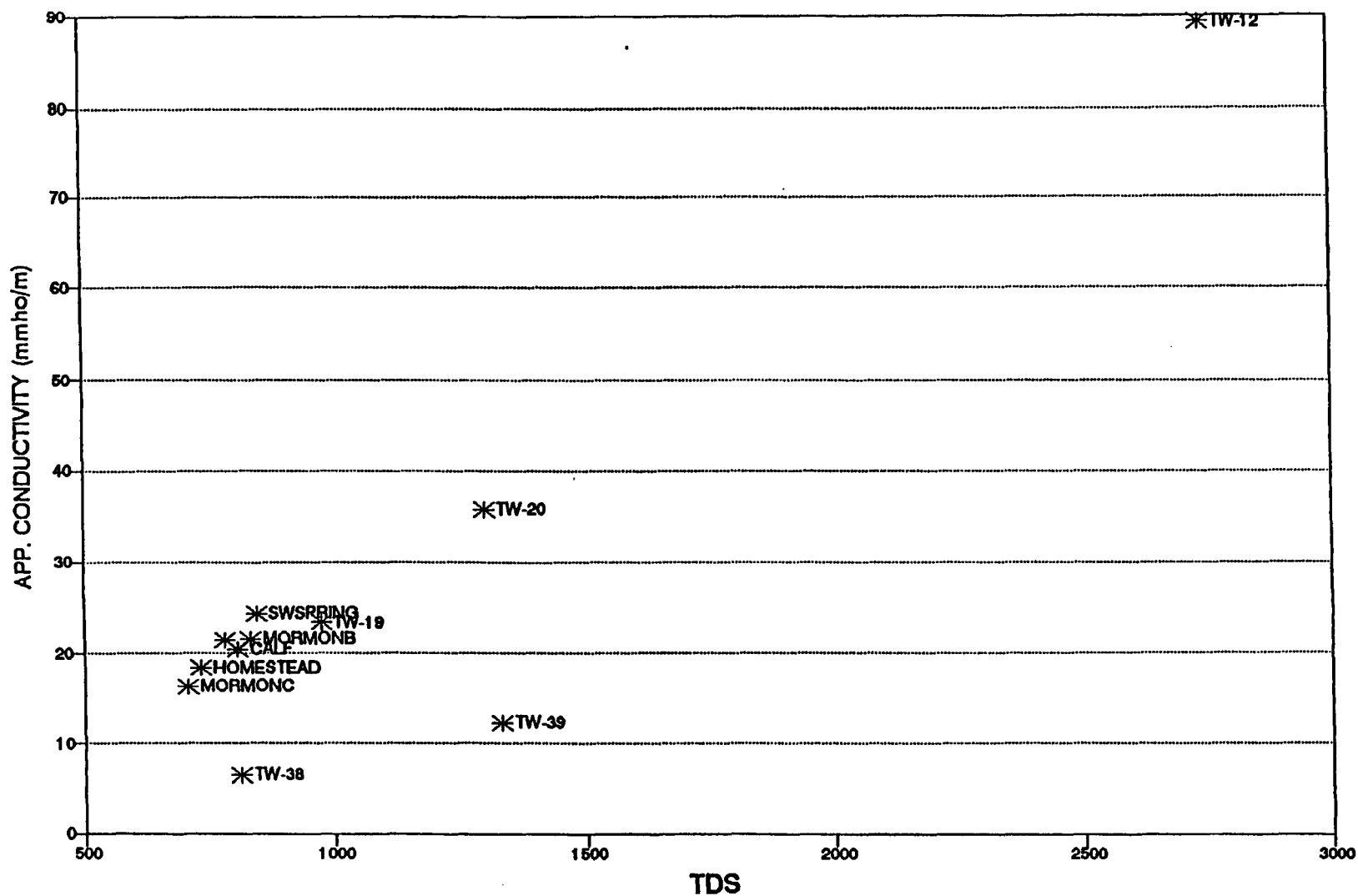
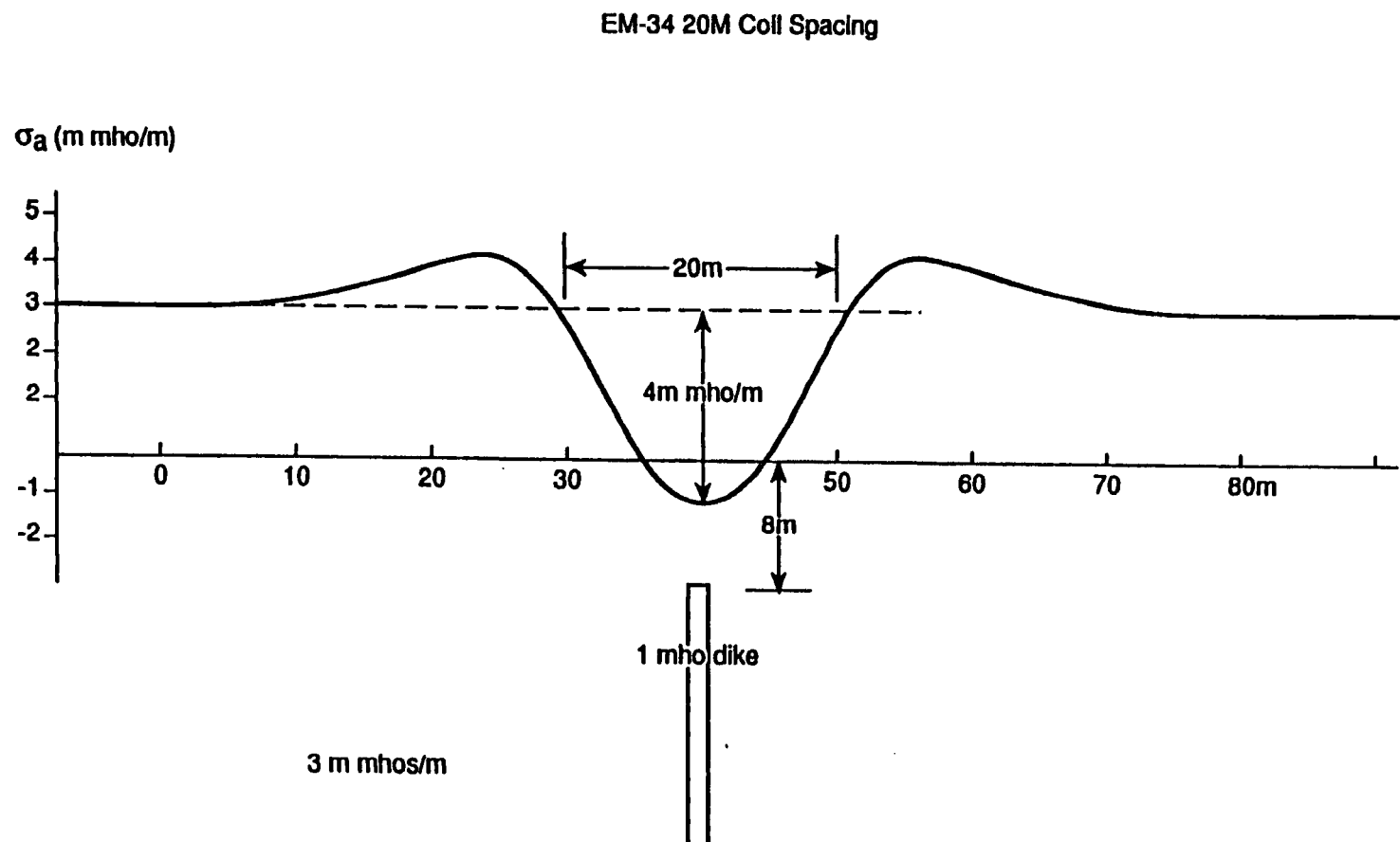


FIGURE 4  
**CALCULATED APPARENT  
 CONDUCTIVITY VERSUS TDS**  
 MONSANTO/GEOPHYSICS/ID



After Geonics EM-34 interpretation manual

PROJECT NO. 913 605 DRAWING NO. 43998 DATE 10/6/82 DRAWN BY TB

FIGURE 5  
TYPICAL VERTICAL DIPOLE RESPONSE OVER  
VERTICLE OFFSET OR DIKE STRUCTURE  
MONSANTO/GEOPHYSICS/ID

Golder Associates

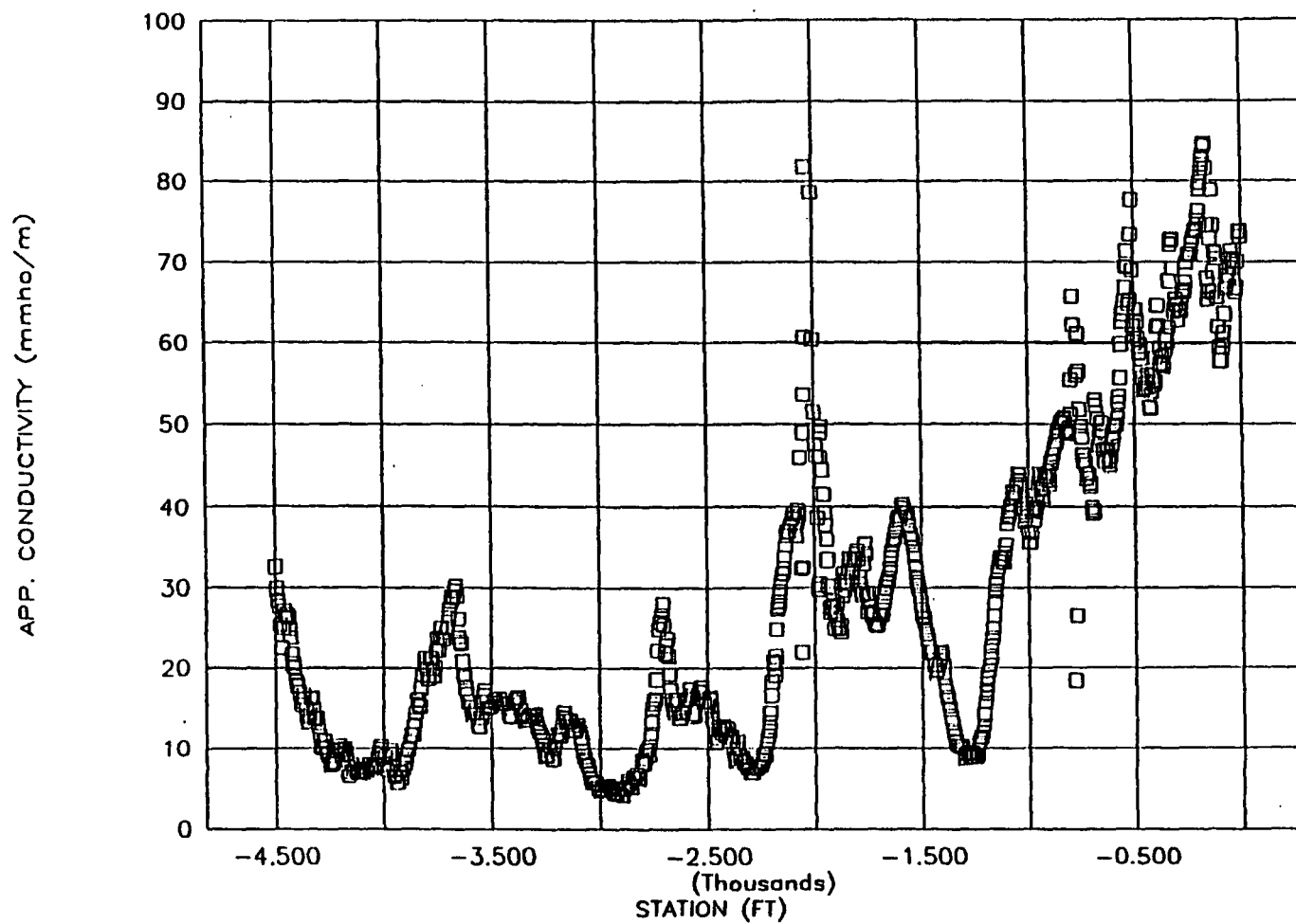


FIGURE 6-A  
RAW DATA PLOT EM-31  
LINE EM-1  
MONSANTO/GEOPHYSICS/ID

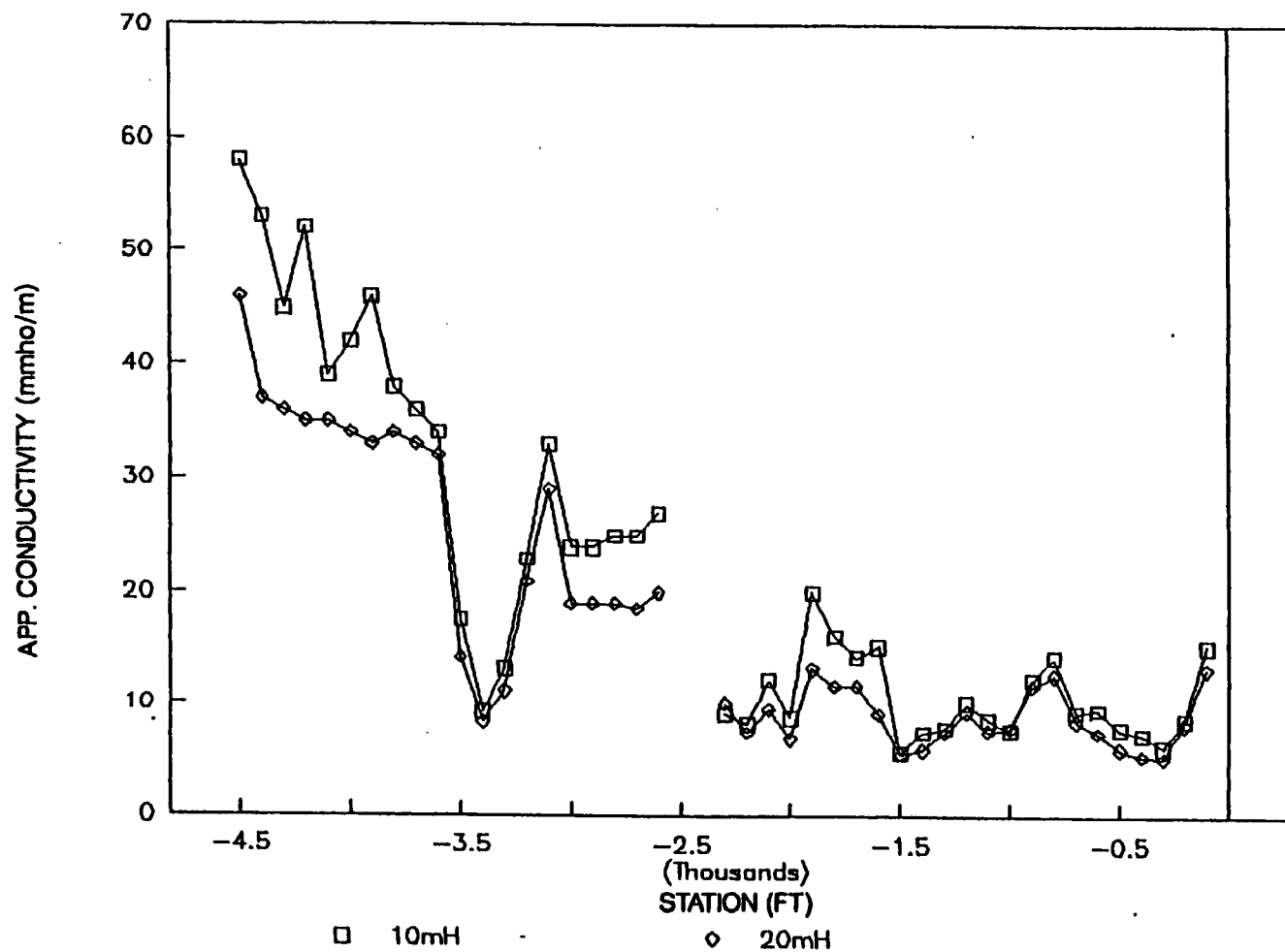


FIGURE 6-B  
 RAW DATA PLOT EM-34  
 HORIZONTAL DIPOLE, LINE EM-1  
 MONSANTO/GEOPHYSICS/ID

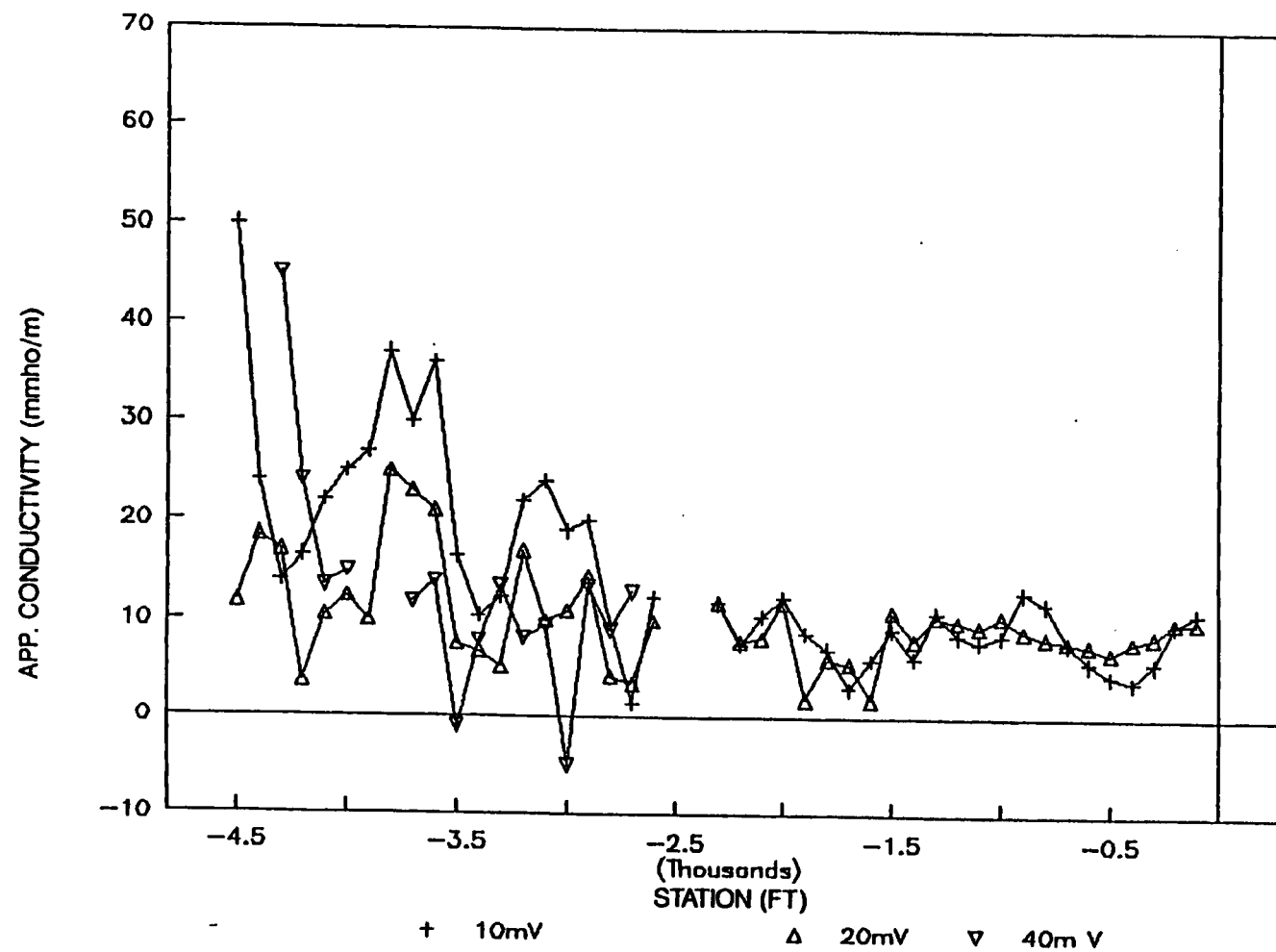


FIGURE 6-C  
RAW DATA PLOT EM-34  
VERTICAL DIPOLE, LINE EM-1  
MONSANTO/GEOPHYSICS/ID

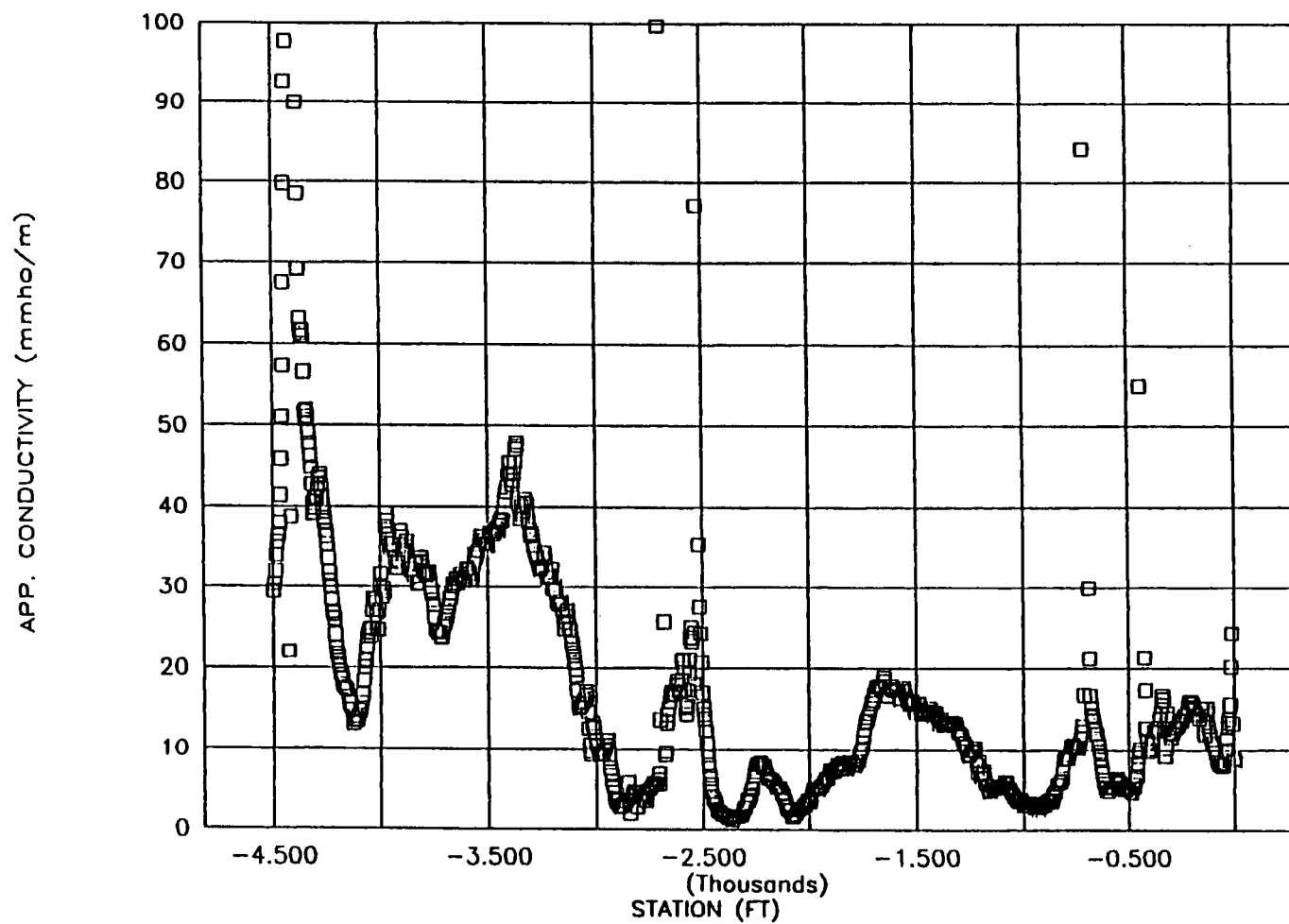


FIGURE 7-A  
RAW DATA PLOT EM-31  
LINE EM-2  
MONSANTO/GEOPHYSICS/ID

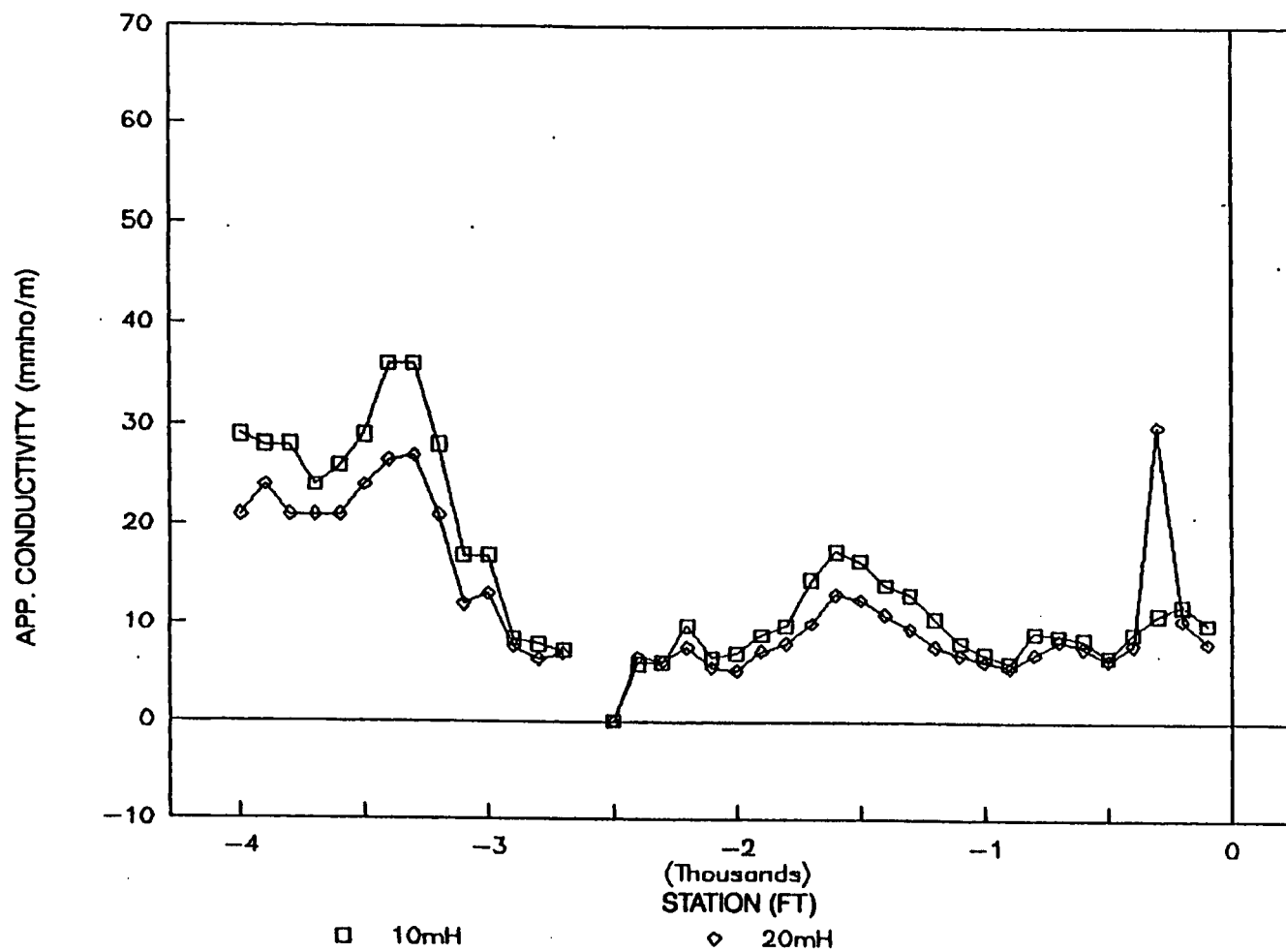


FIGURE 7-B  
RAW DATA PLOT EM-34  
HORIZONTAL DIPOLE, LINE EM-2  
MONSANTO GEOPHYSICS/ID

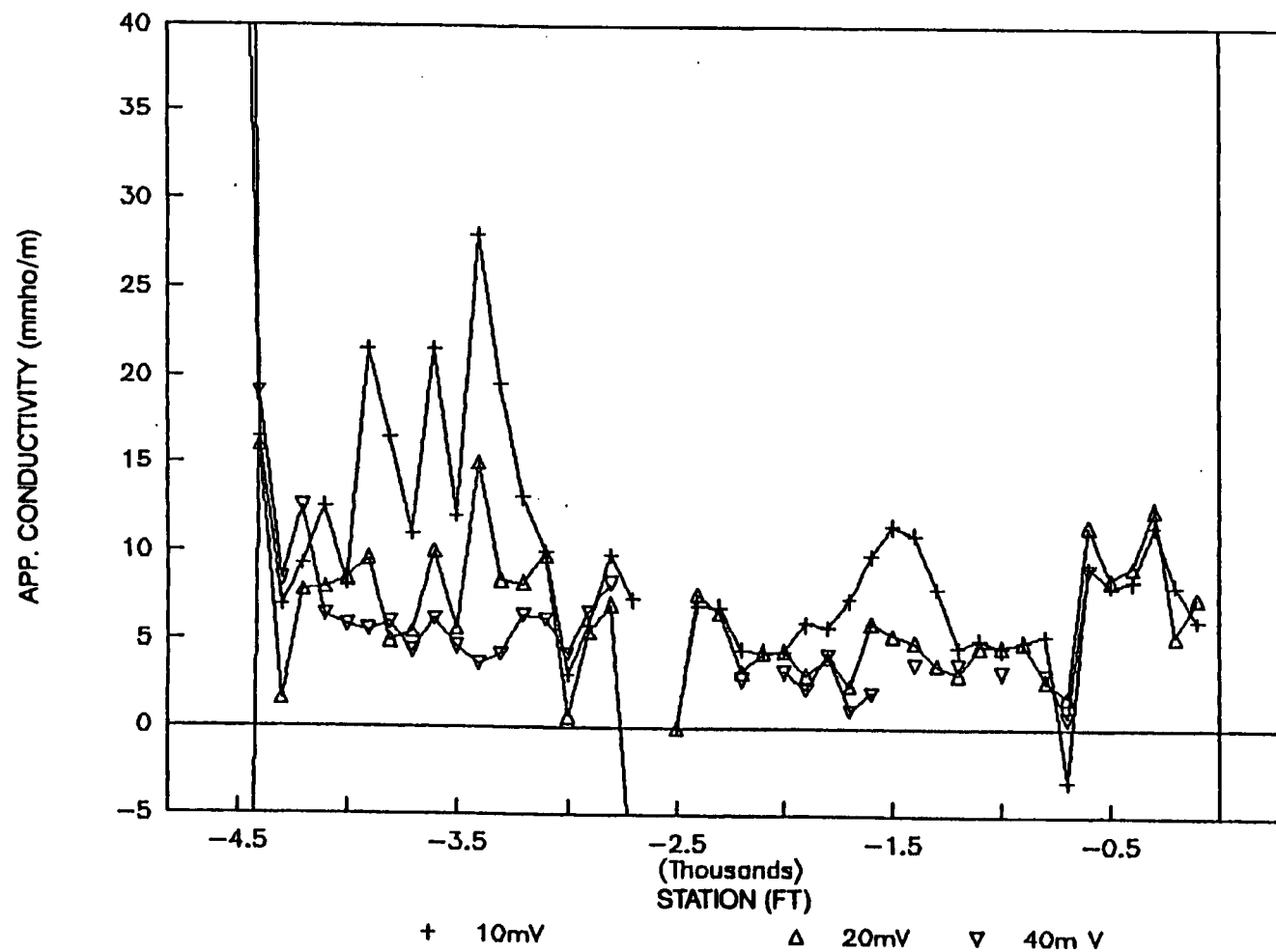


FIGURE 7-C  
RAW DATA PLOT EM-34  
VERTICAL DIPOLE, LINE EM-2  
MONSANTO/GEOPHYSICS/ID

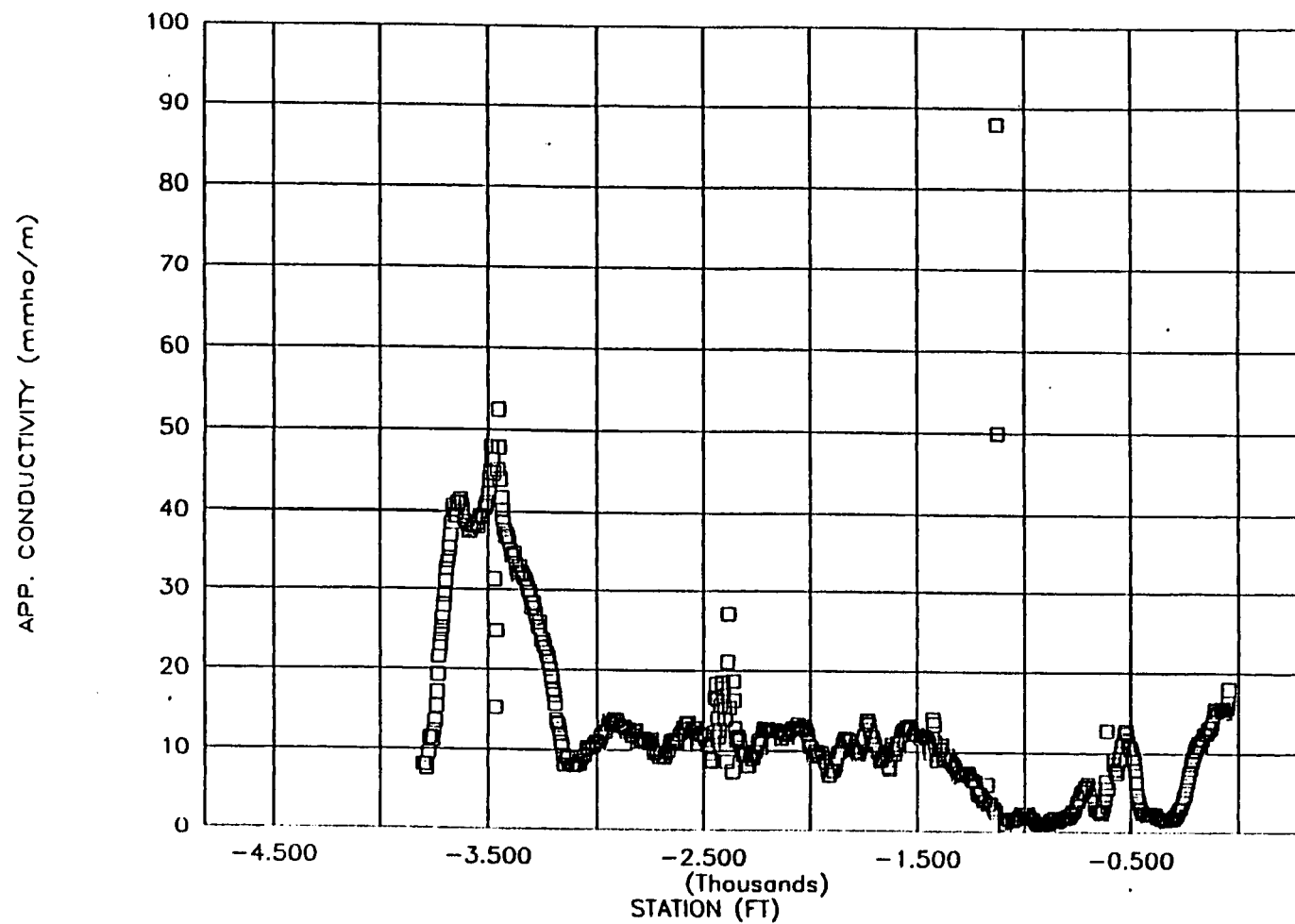


FIGURE 8-A  
RAW DATA PLOT EM-31  
LINE EM-3  
MONSANTO/GEOPHYSICS/ID

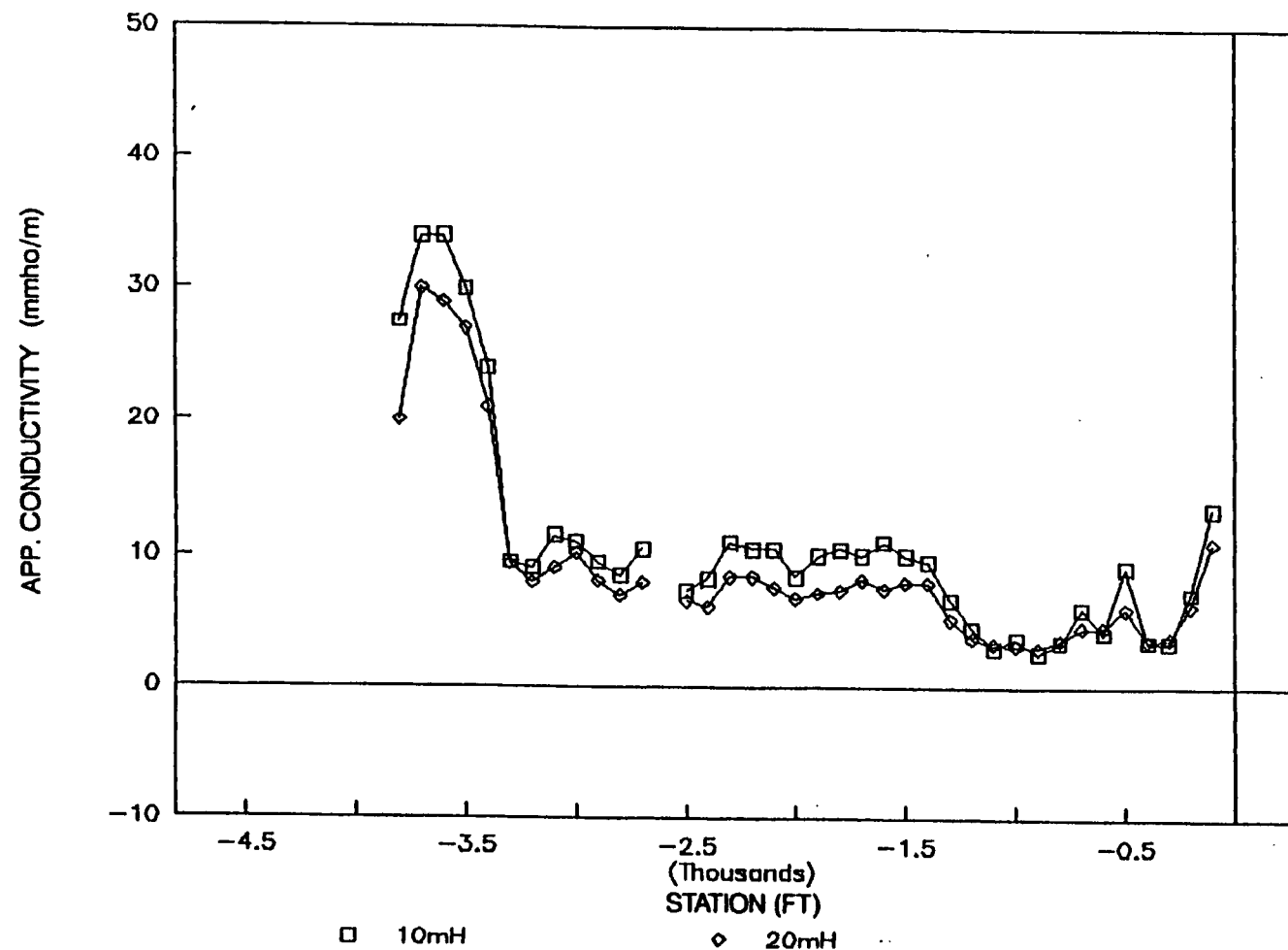


FIGURE 8-B  
RAW DATA PLOT EM-34  
HORIZONTAL DIPOLE, LINE EM-3  
MONSANTO/GEOPHYSICS/ID

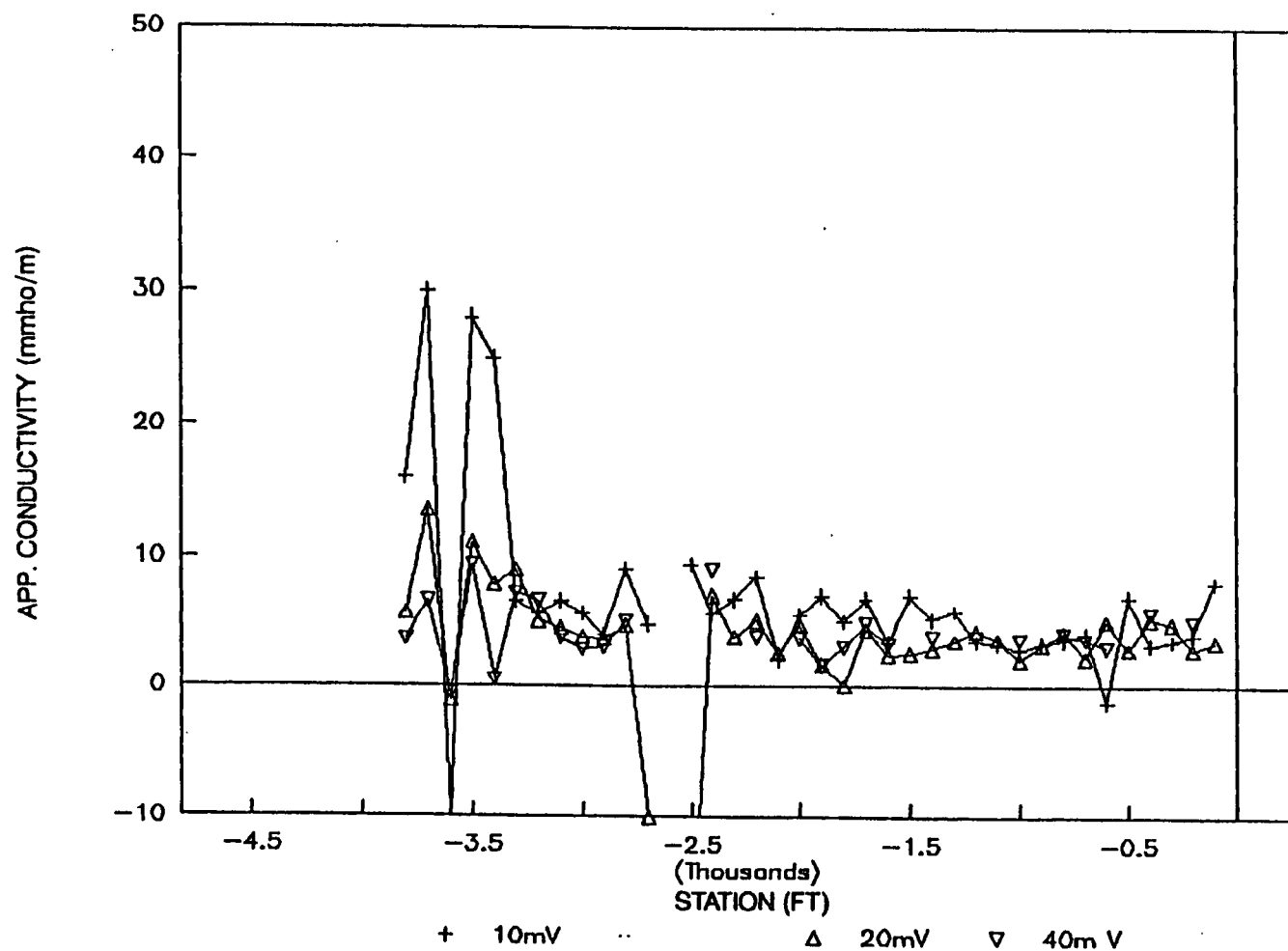


FIGURE 8-C  
 RAW DATA PLOT EM-34  
 VERTICAL DIPOLE, LINE EM-3  
 MONSANTO/GEOPHYSICS/ID

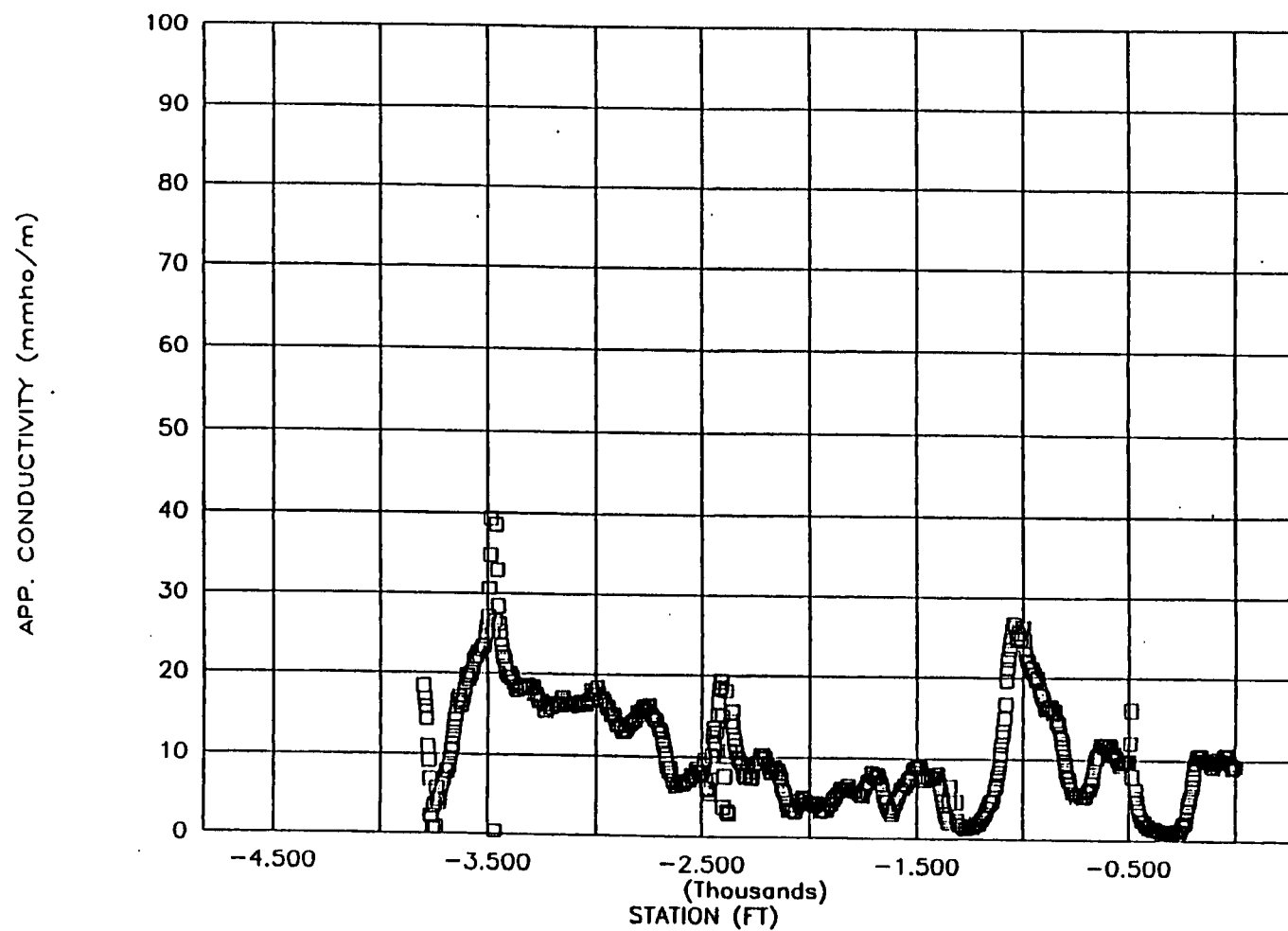


FIGURE 9-A  
RAW DATA PLOT EM-31  
LINE EM-4  
MONSANTO/GEOPHYSICS/ID

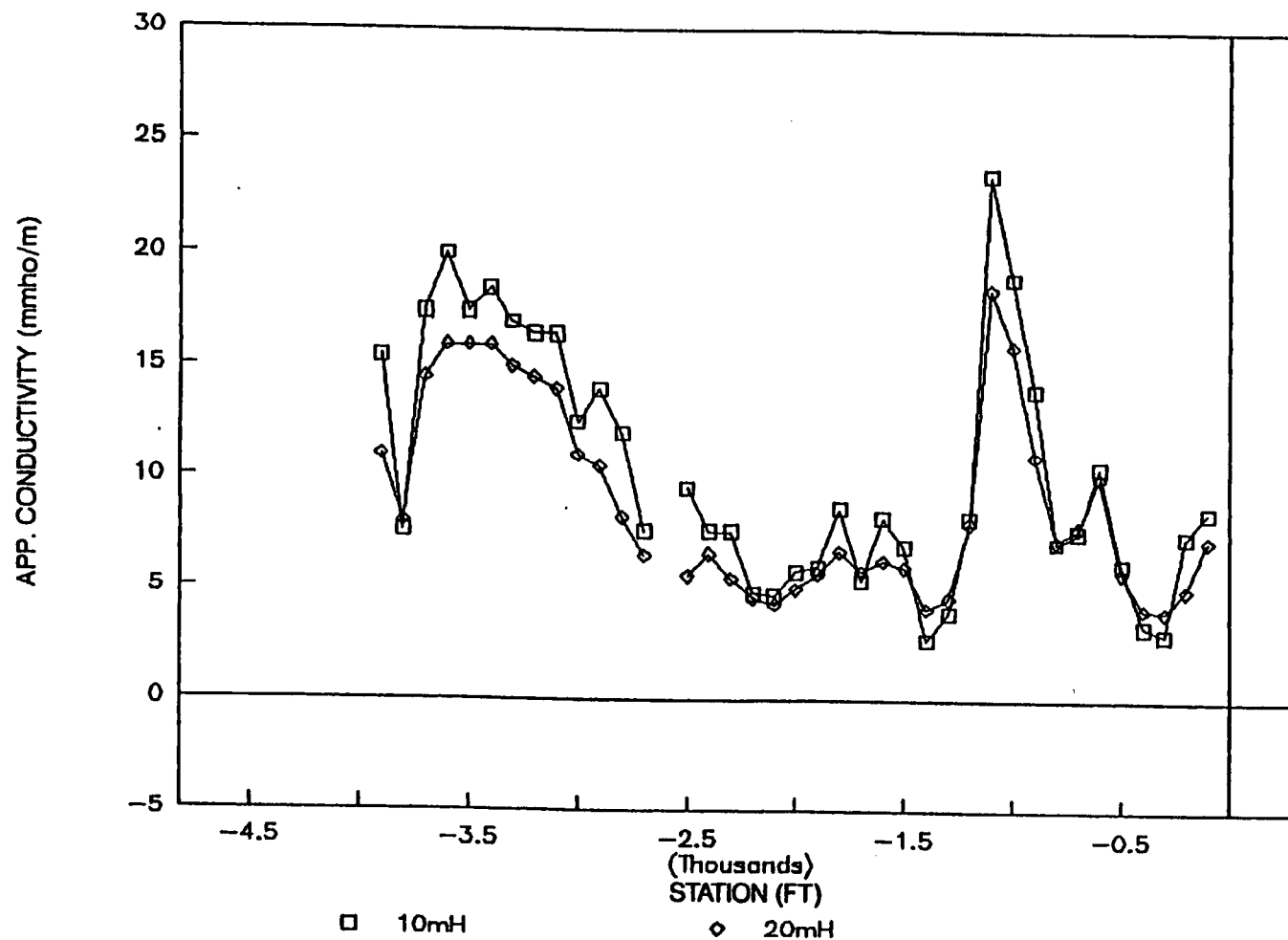


FIGURE 9-B  
RAW DATA PLOT EM-34  
HORIZONTAL DIPOLE, LINE EM-4  
MONSANTO/GEOPHYSICS/ID

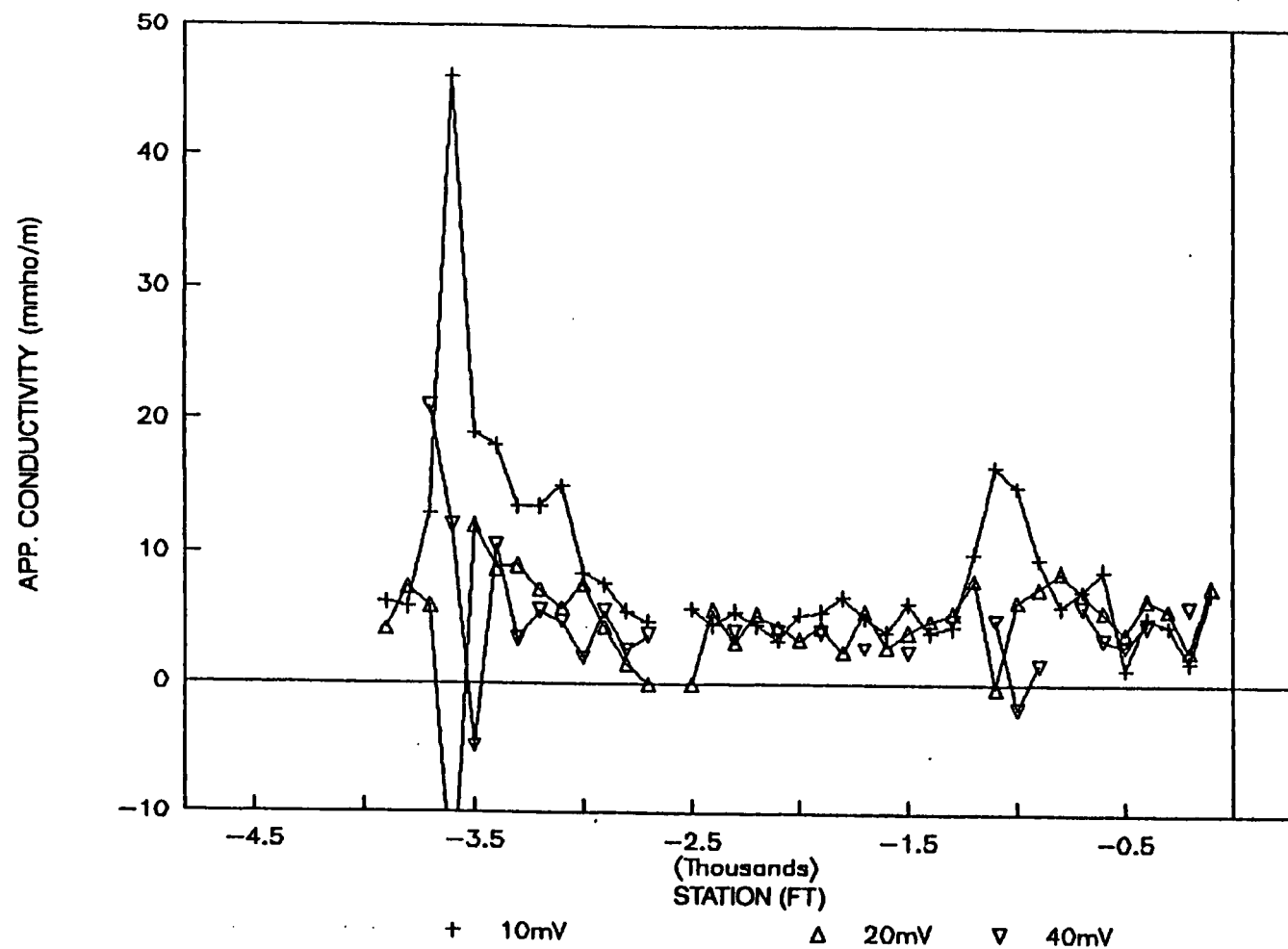


FIGURE 9-C  
RAW DATA PLOT EM-34  
VERTICAL DIPOLE, LINE EM-4  
MONSANTO/GEOPHYSICS/ID

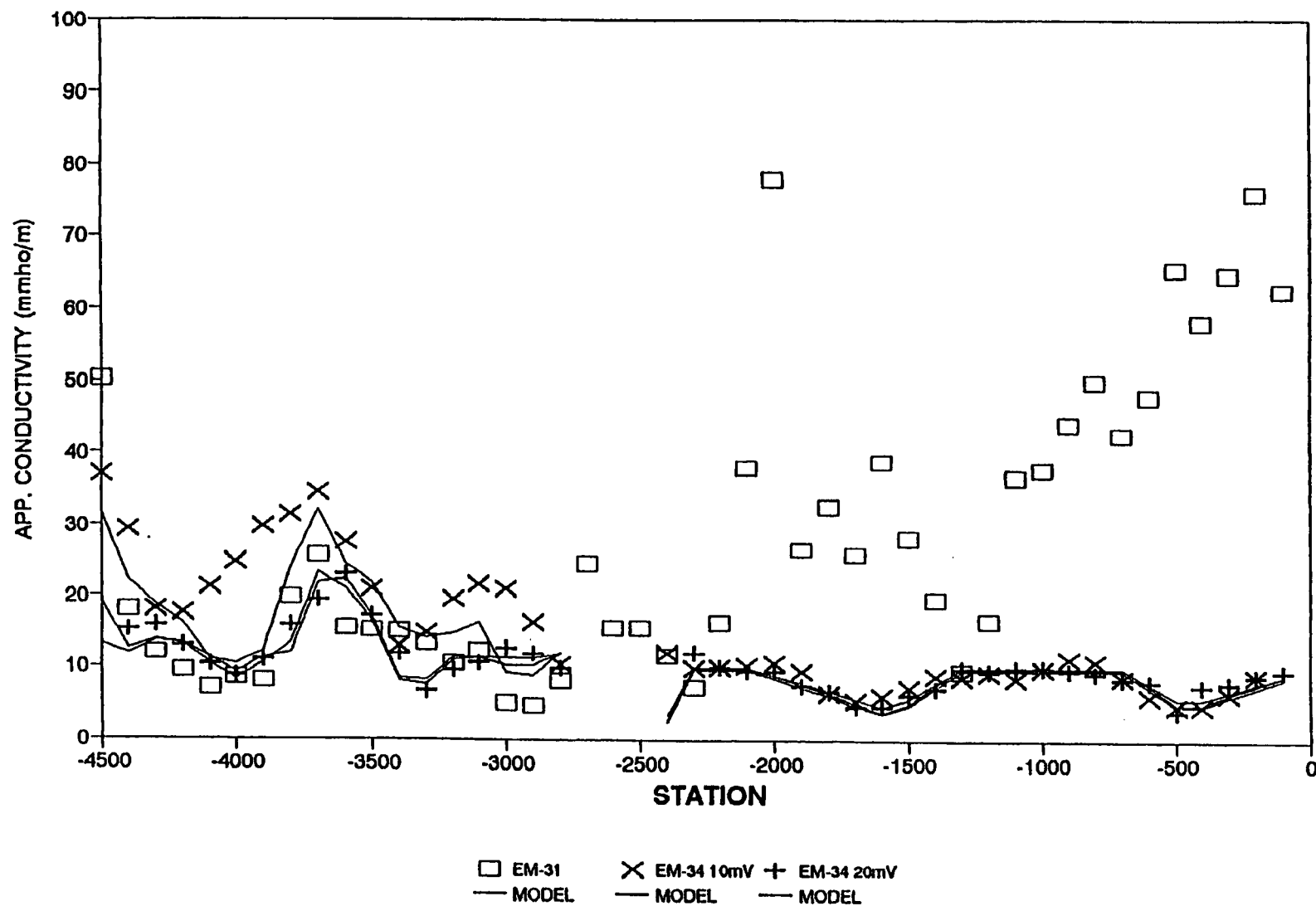


FIGURE 10-A  
 MODEL EM CONDUCTIVITY  
 PROFILE: LINE EM-1  
 MONSANTO/GEOPHYSICS/ID

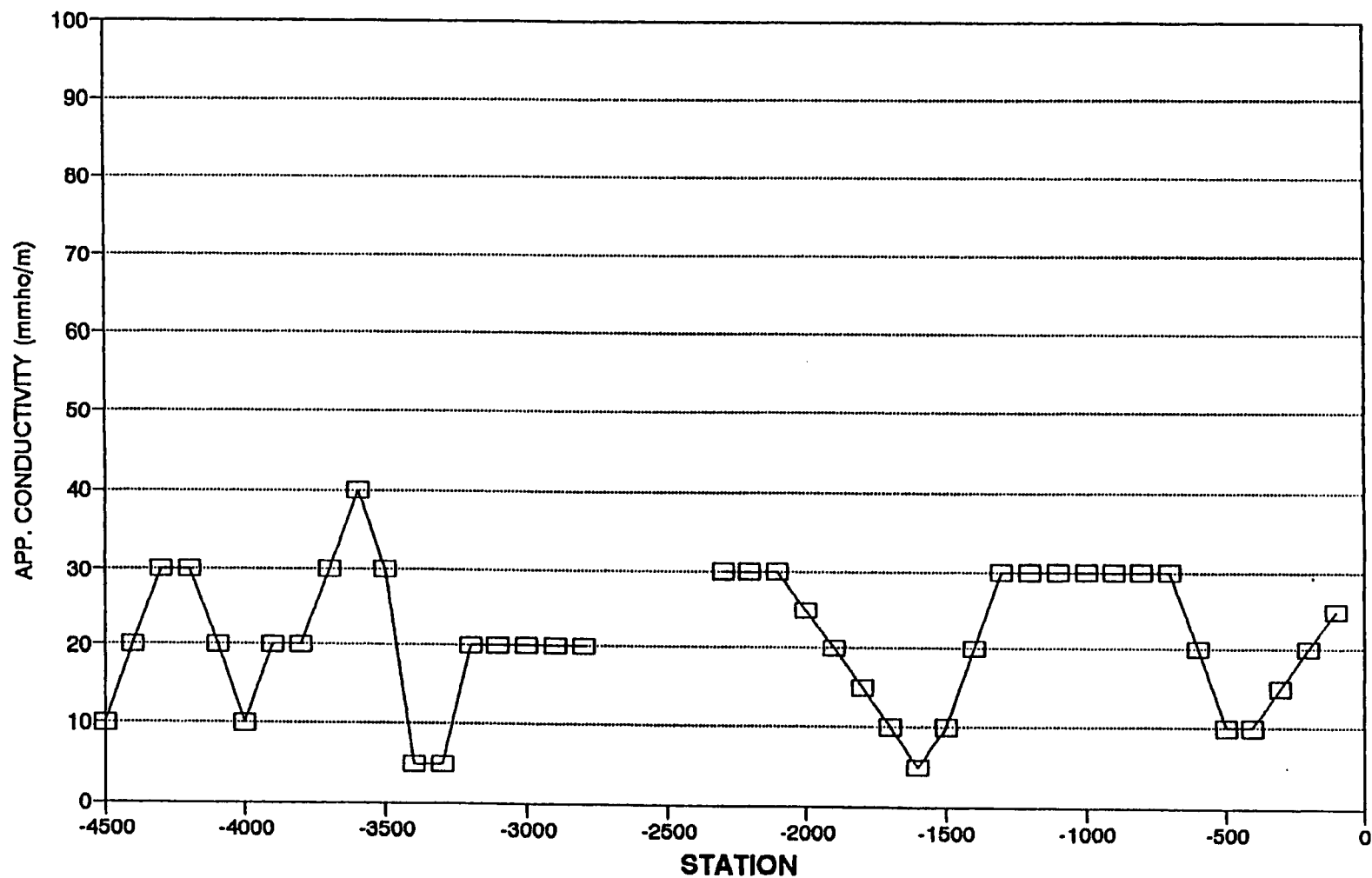


FIGURE 10-B  
 MODEL EM CONDUCTIVITY  
 BASALT B-IV: LINE EM-1  
 MONSANTO/GEOPHYSICS/ID

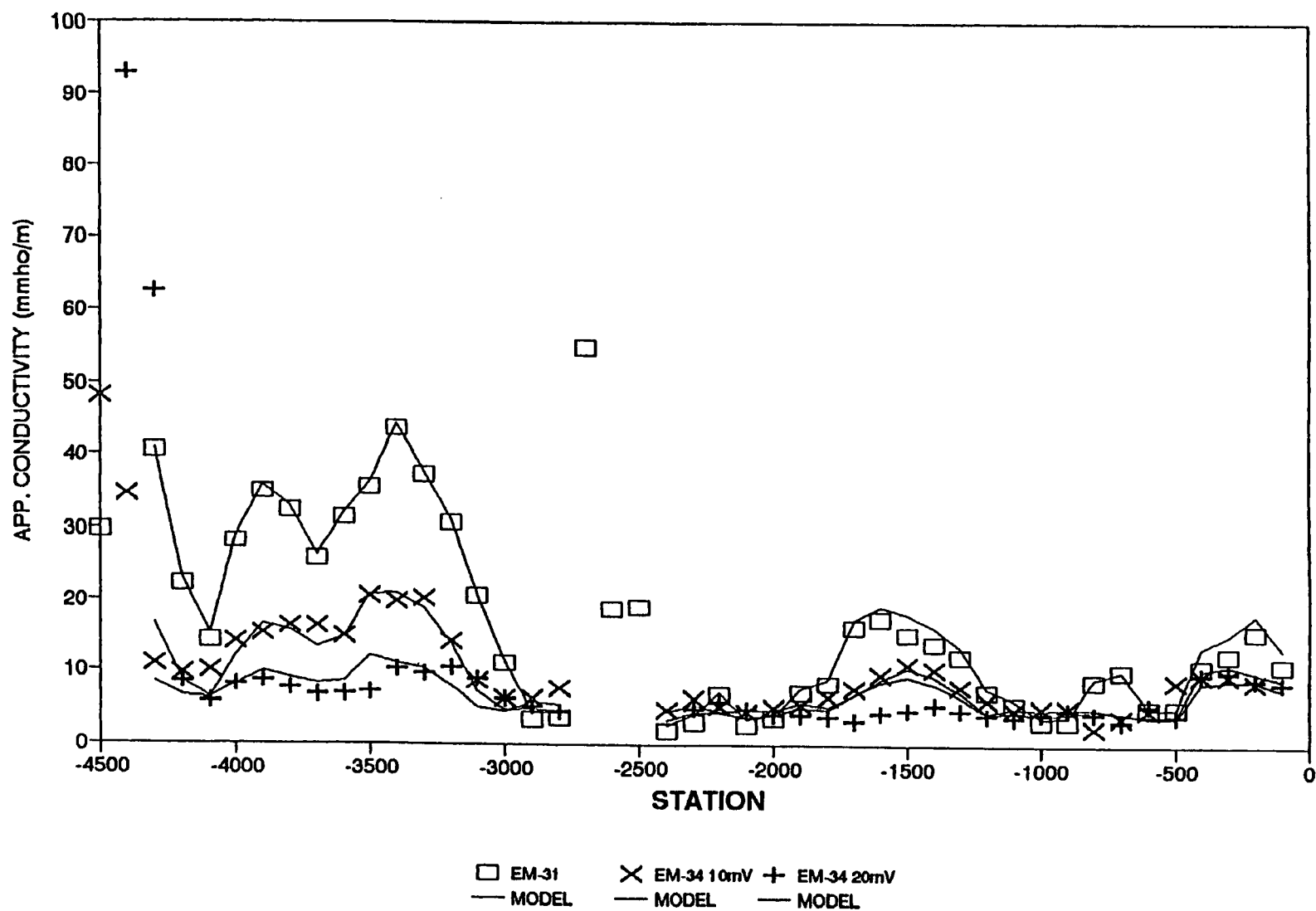


FIGURE 11-A  
 MODEL EM CONDUCTIVITY  
 PROFILE: LINE EM-2  
 MONSANTO/GEOPHYSICS/ID

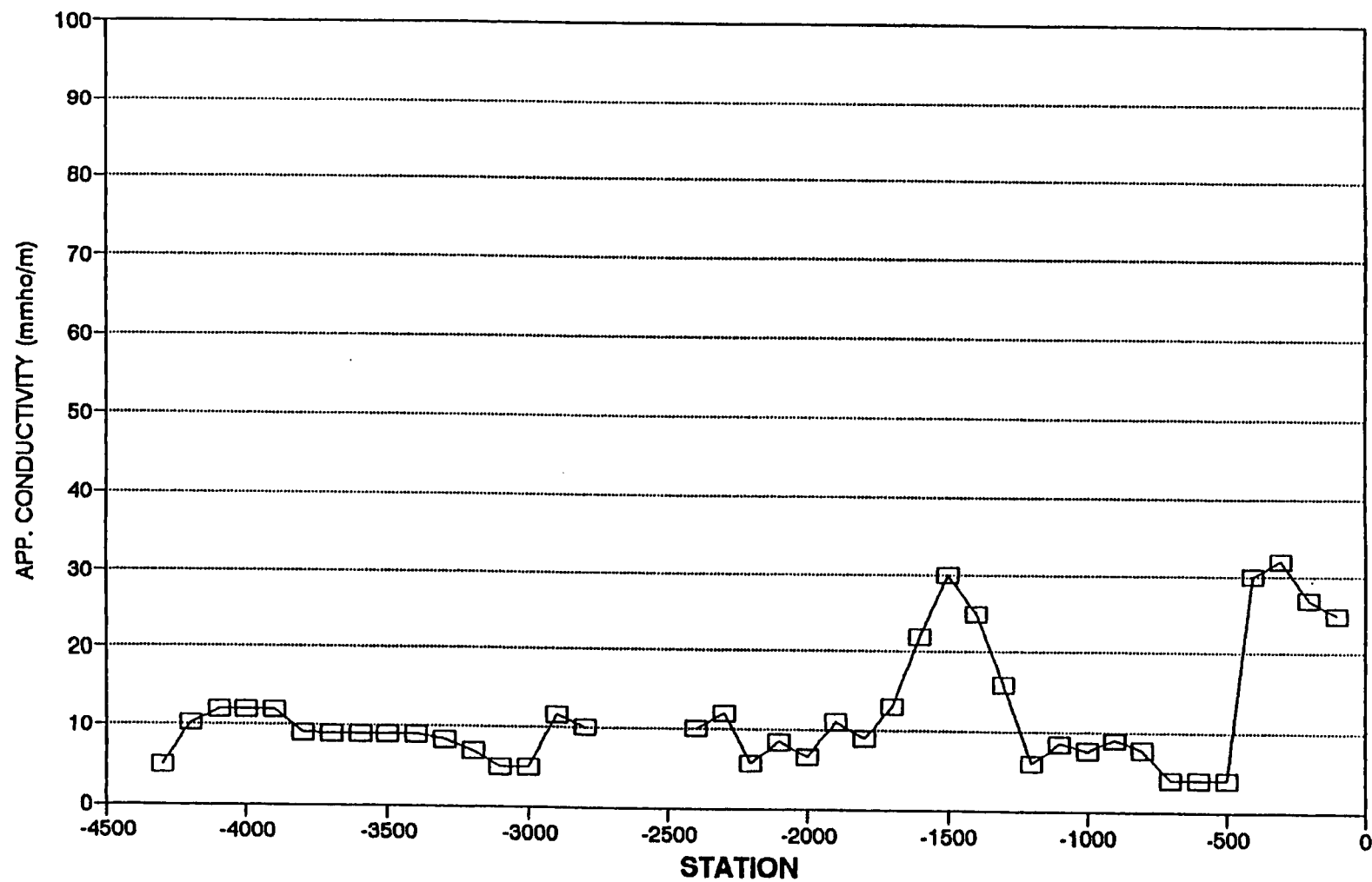


FIGURE 11-B  
 MODEL EM CONDUCTIVITY  
 BASALT B-IV: LINE EM-2  
 MONSANTO/GEOPHYSICS/ID

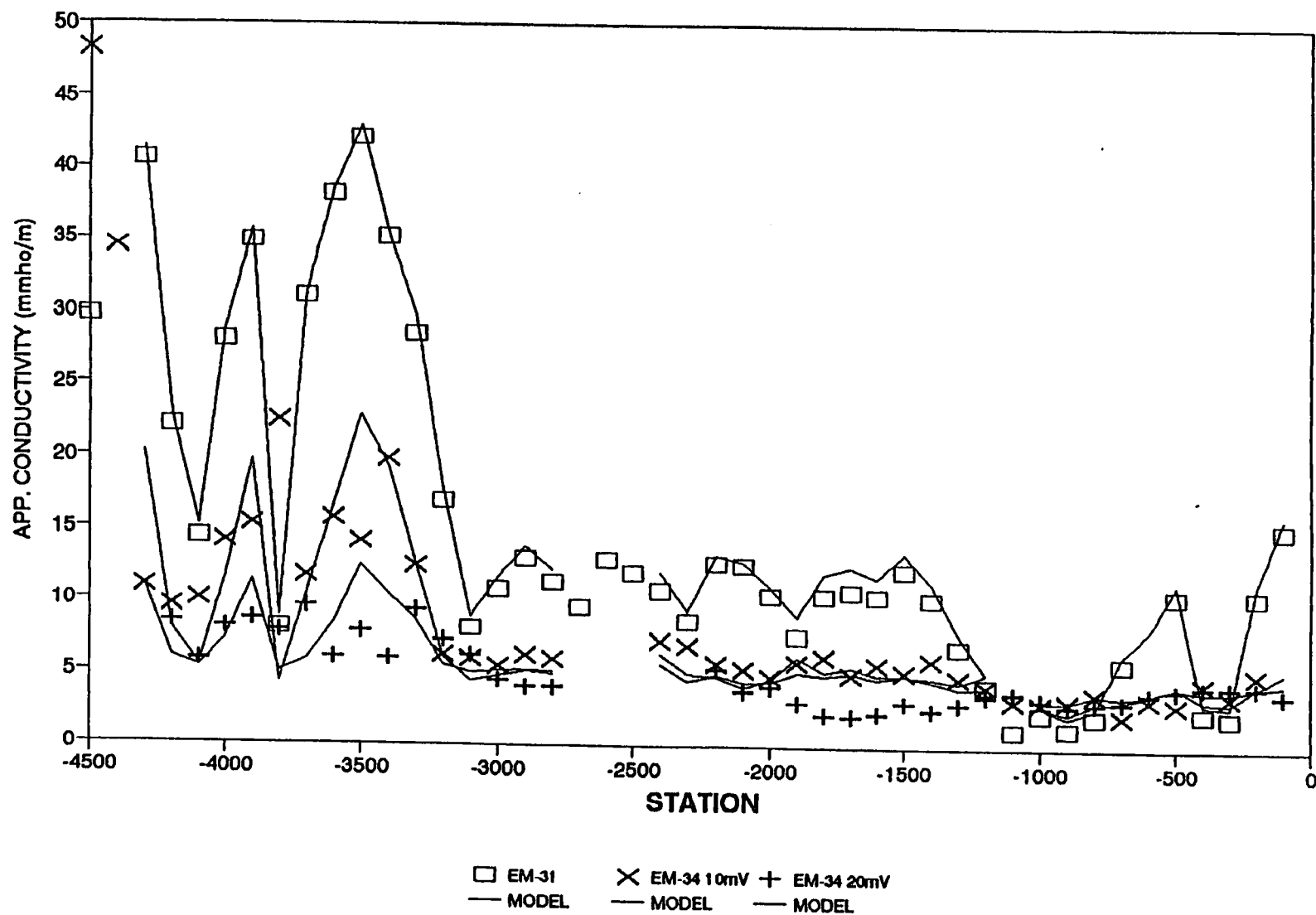


FIGURE 12-A  
MODEL EM CONDUCTIVITY  
PROFILE: LINE EM-3  
MONSANTO/GEOPHYSICS/ID

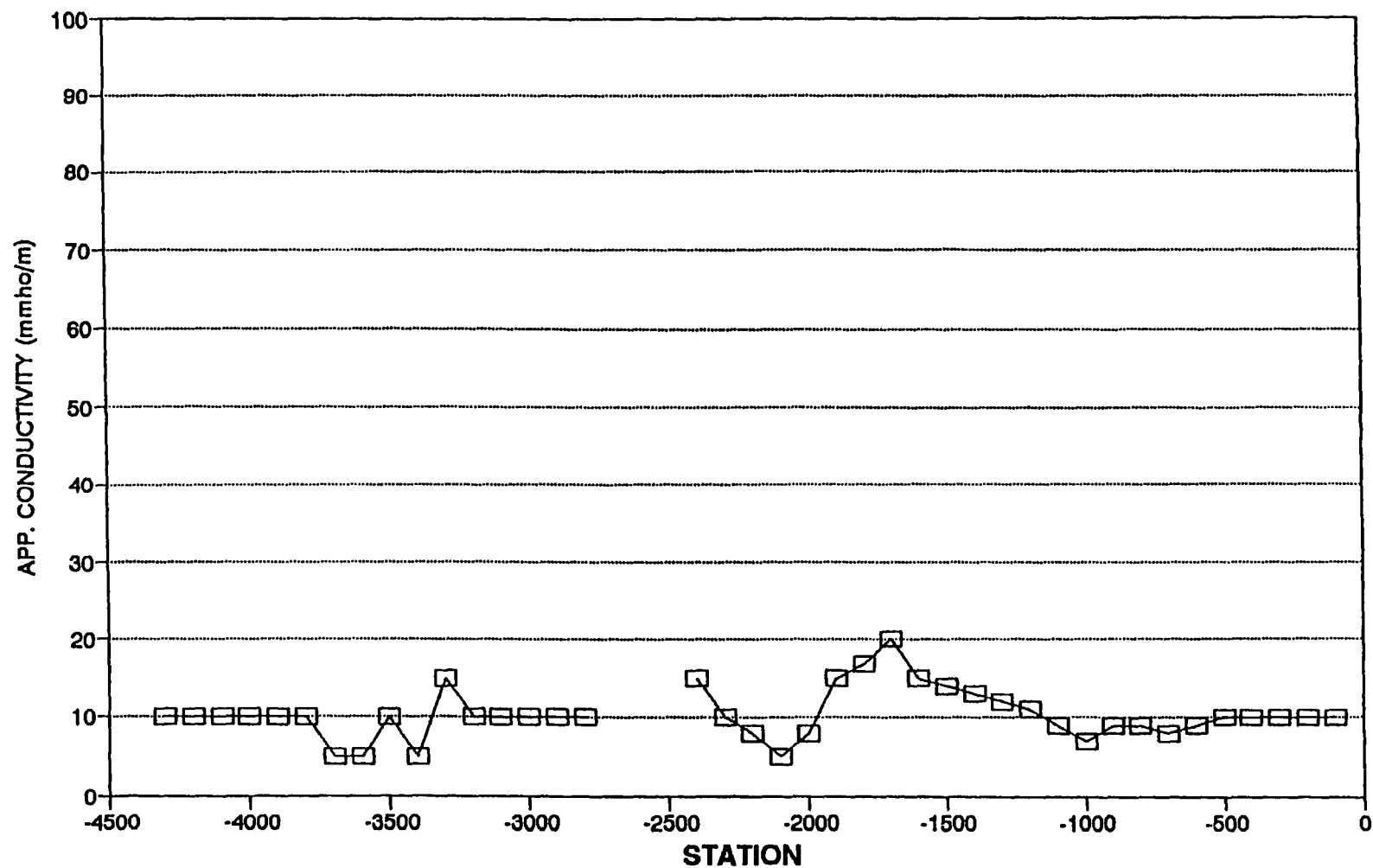


FIGURE 12-B  
 MODEL EM CONDUCTIVITY  
 BASALT B-IV: LINE EM-3  
 MONSANTO/GEOPHYSICS/ID

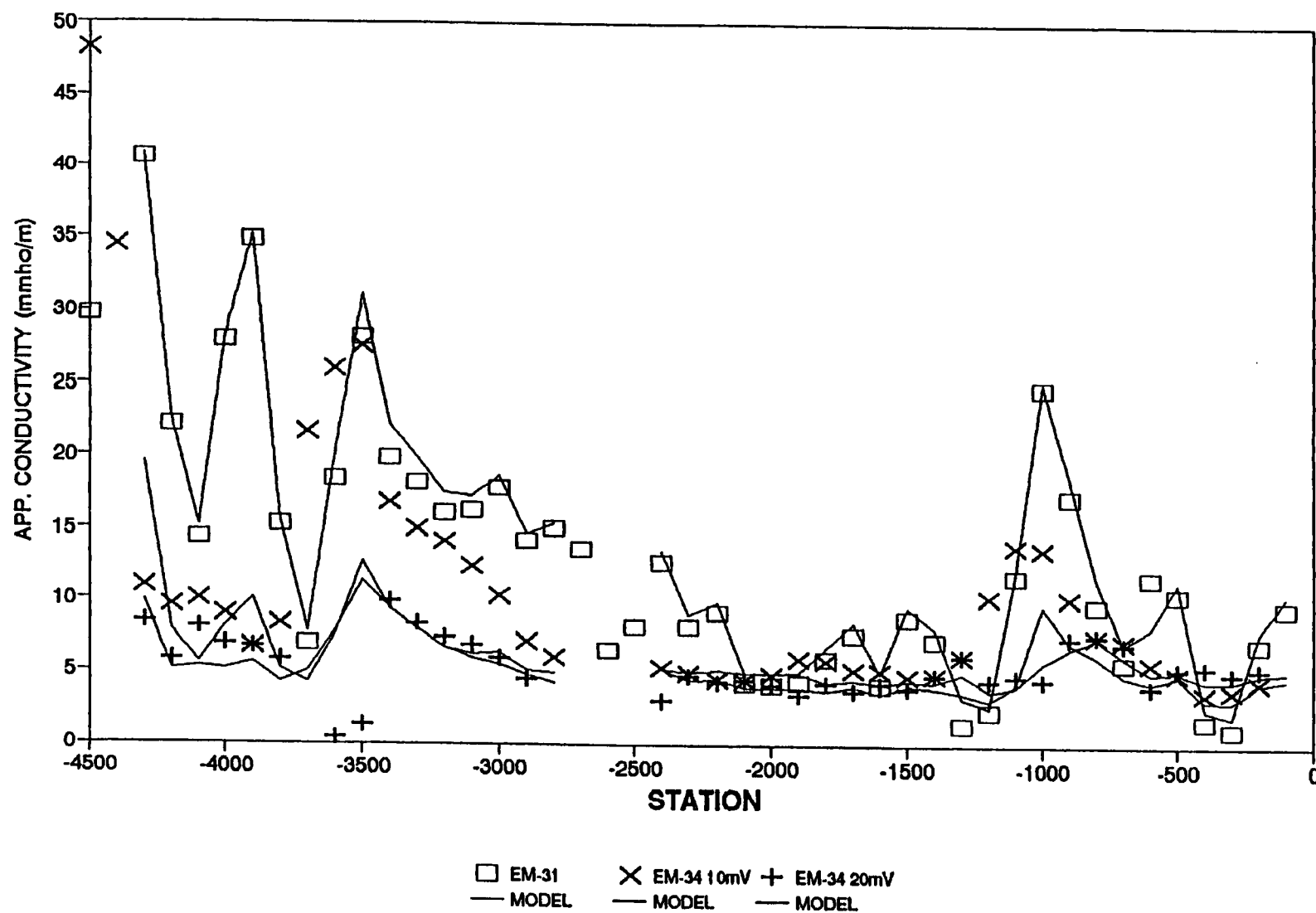
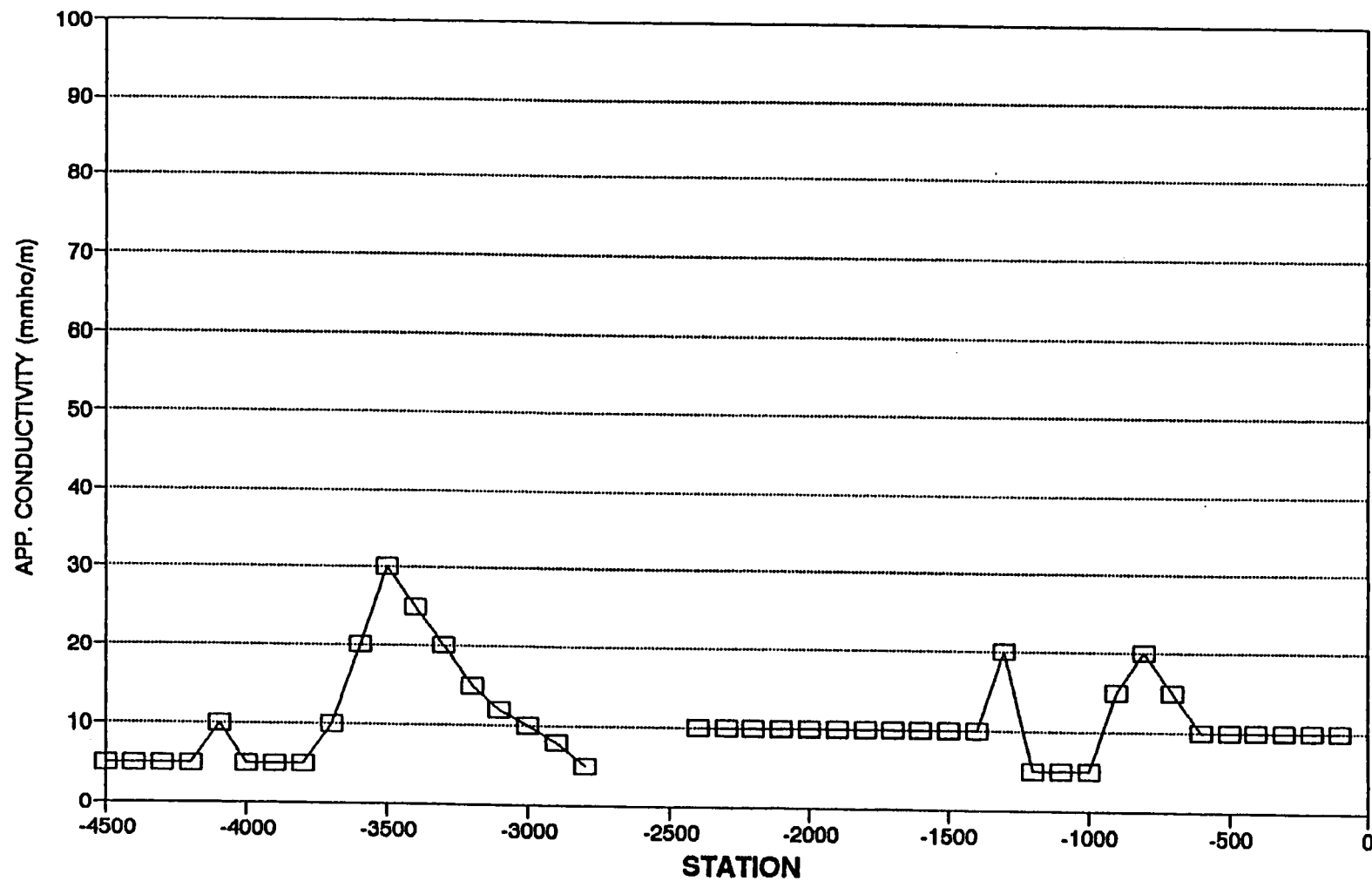


FIGURE 13-A  
 MODEL EM CONDUCTIVITY  
 PROFILE: LINE EM-4  
 MONSANTO/GEOPHYSICS/10



EM-31

FIGURE 13-B  
MODEL EM CONDUCTIVITY  
BASALT B-IV: LINE EM-4  
MONSANTO/GEOPHYSICS/ID

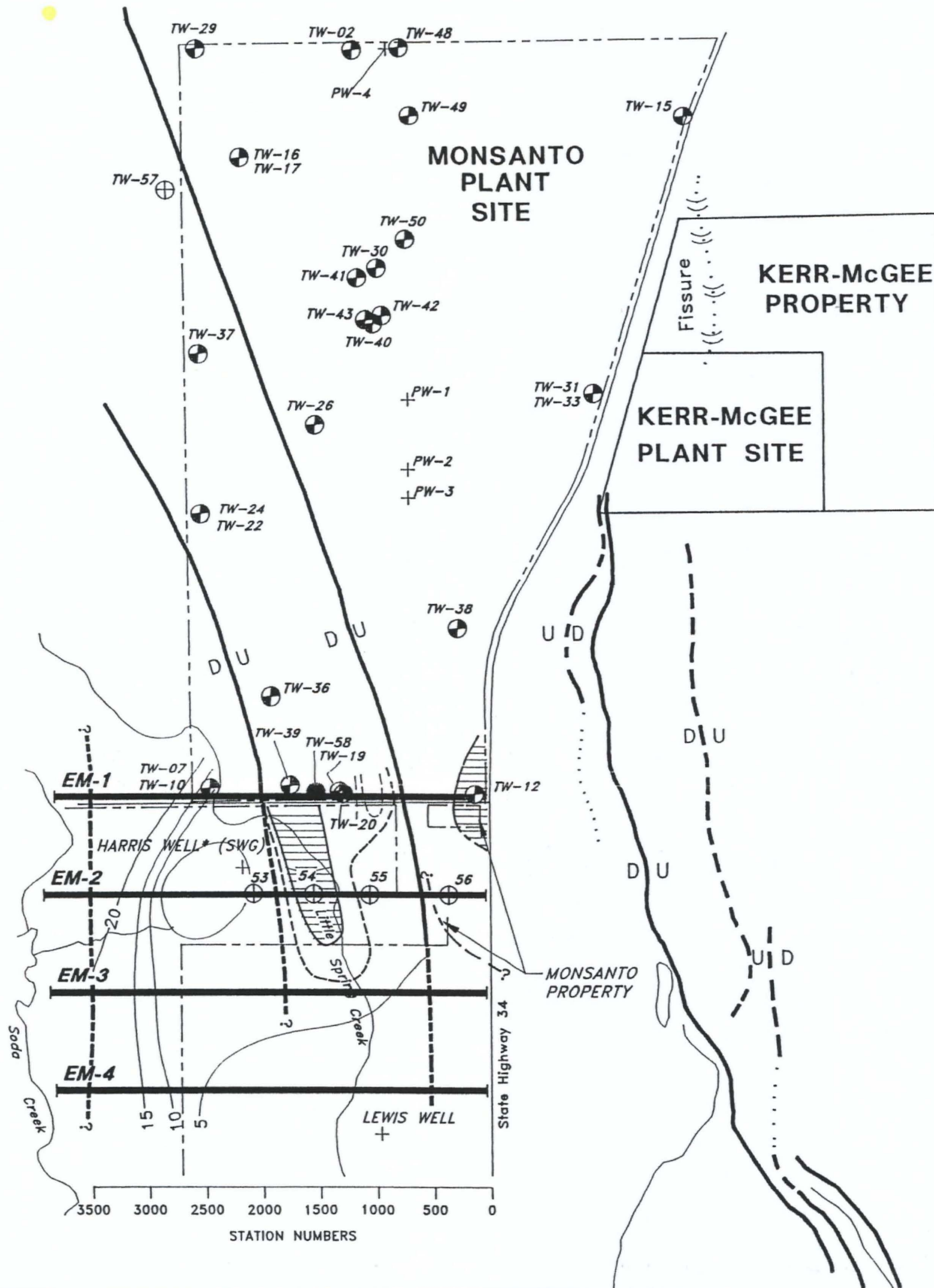


FIGURE 14  
**ESTIMATED PLUME EXTENT AND PROPOSED WELL LOCATIONS**  
MONSANTO/GEOPHYSICS/ID



APPENDIX M  
LAND-USE SURVEY

(Don't call Merle Cellan anymore - he doesn't want to answer more questions)

<b>PROPERTY DESCRIPTION</b>	
Name of property owner: <u>Merle Cellan - 547-4216</u>	Property ID: <u>1</u>
Name of property manager/tenant: <u>same</u>	Date: <u>6/7/93</u>
Property address: <u>1853 Government Dam Rd</u> <u>Soda Springs ID</u>	Surveyor: <u>Yates</u>
Property area: <u>560 acres</u> within 2km of Monsanto	
Area in agriculture: <u>~ 440 acres</u>	
Location description: <u>directly west of Monsanto Plant</u>	
Township: <u>T8S</u> Range: <u>42E</u> Section (nearest 1/4 1/4): <u>parts of sections</u> <u>8S</u> <u>41E</u>	
<b>RESIDENT/LAND USER INFORMATION</b>	<u>T8S R42E 31 + 30</u> <u>T8S R41E 25 + 26</u>
How long has the property been in current ownership: <u>since 1953</u>	
List previous owner(s)/date(s) of sale: <u>Doug Cornelison</u>	
Number/ ages of people residing on property: <u>1 - Merle Cellan</u>	
Length of residency per year (seasonal or year-round): <u>8 months / yr</u>	
How many people work on property but reside elsewhere: <u>3 - Sid Cellan, Lonnie Cellan, Tammy Cole</u>	
Daily hours: <u>400 hrs / year</u>	
Number of days/year: <u>May, June + September</u>	
Seasons of work: <u>May, June + September</u>	
<b>EXPECTED FUTURE LAND USES</b>	
<u>Same</u>	
<b>OTHER LAND USE COMMENTS</b>	
<b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>	
<u>Roll 1, #14 looking NW from SE corner of</u> <u>Tammy Cole's property. Merle's property is in the</u> <u>background</u>	

## CROP PRODUCTION

Type of Crop	bushey acre Quantity	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
wheat	50	440	April-Sept	dry	Soda Springs
Water Sources, If Irrigated:					
NA					
Describe crop rotation schedule:					
every three years with barley + summer fallow					

Elevator

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

harrow (breaks up clods + holds moisture)

fertilize

drill (plants seeds with cultivator)

What time(s) of year is the soil prepared for planting:

early May (sometimes April)

How many man-hours are spent preparing soil:

100 hrs / yr

How deep is the soil tilled:

10-12 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
Anhydrous Ammonia	80 tons	40 hrs / yr	ground applicator
Dow VLL6	?	?	crop duster airplane

fertilizer  
herbicide

## LIVESTOCK

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources
Describe where livestock are sold or shipped, and for what purpose:						
<b>Livestock Movement</b>						
Are livestock moved to other properties throughout the year, if so describe other locations:						
How long are each type of livestock kept at this location:						
What seasons of the year at this location:						
<b>Livestock Products</b>						
Describe commercial products (e.g., meat, wool, other) produced by livestock:						
Describe livestock products (e.g., eggs, meat, dairy) used by property residents:						

# PROPERTY DESCRIPTION

Name of property owner: LDS Church  
 Name of property manager/tenant: Tammy Cole - 547-2470  
 Property address: no address

Property ID: ~~2B~~ 2A  
 Date: 6/9/93  
 Surveyor: U.C.G.

Property area: ~ 160 acres  
 Area in agriculture: ~ 160 acres  
 Location description: Northwest of Plant

Township: 8S Range: 41E Section (nearest 1/4 1/4) part of section 30  
42E T8S R42E 30  
 T8S R41E 25

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:  
approx. since 1960's

(need to call LDS church in Salt Lake City to find exact date)

List previous owner(s)/date(s) of sale:  
don't know

Number/ ages of people residing on property:  
none

Length of residency per year (seasonal or year-round):  
NA

How many people work on property but reside elsewhere:  
2 / Tammy & Morris Cole

Daily hours: 75 hrs/ yr  
 Number of days/year:  
 Seasons of work: spring, summer, fall

EXPECTED FUTURE LAND USES  
same

## OTHER LAND USE COMMENTS

PHOTOGRAPH NUMBERS AND DESCRIPTIONS  
none

# AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

Cultivator  
harrow  
fertilize + drill

What time(s) of year is the soil prepared for planting:

How many man-hours are spent preparing soil:

20 hrs/yr

How deep is the soil tilled:

10-12"

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
Anhydrous Ammonia	20 tons	3 hrs/yr	ground applicator
2-4D	10 gal	2 hrs/yr	spray truck

## CROP PRODUCTION

Type of Crop	Quantity <sup>bushels/acre</sup>	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
Wheat	~ 50	60	May-Aug	NO	Soda Springs Elevator
barley	~ 50	100	"	"	"

Water Sources, if irrigated:

none

Describe crop rotation schedule:

usually barley has been the only crop. This is  
1st year they had wheat

LIVESTOCK

no livestock

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources

Describe where livestock are sold or shipped, and for what purpose:

**Livestock Movement**

Are livestock moved to other properties throughout the year, if so describe other locations:

How long are each type of livestock kept at this location:

What seasons of the year at this location:

**Livestock Products**

Describe commercial products (e.g., meat, wool, other) produced by livestock:

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

## PROPERTY DESCRIPTION

Name of property owner: LDS Church  
Name of property manager/tenant: Sid Cellan  
Property address: no address

Property ID: 2B  
Date: 6/7/93  
Surveyor: Vates

Property area: 145.6 acres  
Area in agriculture: 145.6 acres  
Location description:  
North of Monsanto Plant

Township: B5 Range: 42E Section (nearest 1/4 1/4) parts of sections  
T8S R2E 30, 29, 19

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

Sid has been farm  
Cellan's been farming it for 7 years. To find out how  
long the Church has owned it: need to call Salt Lake City

List previous owner(s)/date(s) of sale:

Merle Cellan + Chris Phelps + Kay Law

Number/ ages of people residing on property:

none

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

1 - Sid Cellan

Daily hours:

75 hrs/yr

Number of days/year:

Seasons of work:

Spring, summer, fall

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 1 #13 taken from the middle of Sect. 30 looking  
North

none

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator

harrower

fertilizer + drill

What time(s) of year is the soil prepared for planting:

April + May

How many man-hours are spent preparing soil:

20 hrs/year

How deep is the soil tilled:

10-12"

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
Anhydrous Ammonia	20 tons	8 hrs/yr	by applicator - tank with shanks
2-4D	10 gal	2 hrs/yr	spray truck
Curtil	20 gal	2 hrs/yr	spray truck

fertilizer.  
erbicide.  
erbicide

CROP PRODUCTION

Type of Crop	bushel acre Quantity	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
barley	50-55	100	May-Oct	no	Soda Springs
wheat	50-55	45	" "	no	

Water Sources, If Irrigated:

WA

Describe crop rotation schedule:

every three years

## LIVESTOCK

no livestock

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources
Describe where livestock are sold or shipped, and for what purpose:						
<b>Livestock Movement</b>						
Are livestock moved to other properties throughout the year, if so describe other locations:						
How long are each type of livestock kept at this location:						
What seasons of the year at this location:						
<b>Livestock Products</b>						
Describe commercial products (e.g., meat, wool, other) produced by livestock:						
Describe livestock products (e.g., eggs, meat, dairy) used by property residents:						

<b>PROPERTY DESCRIPTION</b> Charlotte Gunnel - 547-3229 Dawe Clegg - 547-3523		<b>Property ID:</b> 3 <b>Date:</b> 6/8/93 <b>Surveyor:</b> Yates
<b>Name of property owner:</b> Trust of Charlotte Gunnel		
<b>Name of property manager/tenant:</b> David Clegg		
<b>Property address:</b> no address		
<b>Property area:</b> 200 acres		
<b>Area in agriculture:</b> 200 acres		
<b>Location description:</b> directly north of Monsanto Plant		
<b>Township:</b> 8S <b>Range:</b> 42E <b>Section (nearest 1/4 1/4)</b> part of Sect. 30		
<b>RESIDENT/LAND USER INFORMATION</b>		
<b>How long has the property been in current ownership:</b> ~ 30 year		
<b>List previous owner(s)/date(s) of sale:</b> don't know		
<b>Number/ ages of people residing on property:</b> none		
<b>Length of residency per year (seasonal or year-round):</b> NA		
<b>How many people work on property but reside elsewhere:</b> none		
<b>Daily hours:</b> NA		
<b>Number of days/year:</b> NA		
<b>Seasons of work:</b> NA		
<b>EXPECTED FUTURE LAND USES</b> CRP - for another 4-5 years		
<b>OTHER LAND USE COMMENTS</b>		
<b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b> Roll 1, #12 photo taken from center of Sect. 30 looking north-northeast		

6/8 10:42 X  
6/8 12:09 X 17:53 X  
13:32 X 19:35 X  
15:07 X



## CROP PRODUCTION

Type of Crop	Quantity	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
Water Sources, If Irrigated:					
Describe crop rotation schedule:					

**LIVESTOCK**

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources

Describe where livestock are sold or shipped, and for what purpose:

**Livestock Movement**  
 Are livestock moved to other properties throughout the year, if so describe other locations:

How long are each type of livestock kept at this location:

What seasons of the year at this location:

**Livestock Products**  
 Describe commercial products (e.g., meat, wool, other) produced by livestock:

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

## PROPERTY DESCRIPTION

Name of property owner: Myrl Wells - 547-3475 ✓Name of property manager/tenant: sameProperty address: 1976 Gouverment Dam RdSoda Spring ID~380Property area: 640 ~~1400~~ acres (only ~280 acres within 2kmArea in agriculture: 640 ~~400~~ acres of Monsanto)Location description: north-northwest of Monsanto PlantTownship: 88 Range: 42E Section (nearest 1/4 1/4)most of Sect 19  
(except the NW corner)

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

since 1952

List previous owner(s)/date(s) of sale:

Oliver ~~B~~ Brower, Deaton

Number/ ages of people residing on property:

2 / 65, 63

Length of residency per year (seasonal or year-round):

6 months

How many people work on property but reside elsewhere:

no

Daily hours:

NA

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

hope to sell in 1993

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 1, #11. Taken from border of Sections 30 + 31 19  
along 3 mile knoll road looking NW.

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

harrow, cultivator, fertilize, drill (plant)

~~Fall-plowed~~

What time(s) of year is the soil prepared for planting:

Spring - plant

Fall - plowed

How many man-hours are spent preparing soil:

Fall - 10 hrs / day  
Spring -

400 - 500 hrs / yr

How deep is the soil tilled:

12 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
Anhydrous	10000 gal	30 hours	behind tractor
24D herbicide	ave 10 gal	8 hours	spray truck

fertilizer

ammonia  
2-4D



no livestock

LIVESTOCK

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources

Describe where livestock are sold or shipped, and for what purpose:

**Livestock Movement**  
Are livestock moved to other properties throughout the year, if so describe other locations:

How long are each type of livestock kept at this location:

What seasons of the year at this location:

**Livestock Products**  
Describe commercial products (e.g., meat, wool, other) produced by livestock:

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

<b>PROPERTY DESCRIPTION</b>			
Name of property owner:	<u>Myrl Wells</u>	Property ID:	<u>4B</u>
Name of property manager/tenant:	<u>same</u>	Date:	<u>6/7/93</u>
Property address:	<u>no address</u>	Surveyor:	<u>Yates</u>
Property area:	<u>840</u> <del>160</del> <u>acres</u> (~ <del>160</del> within 2km of Monsanto)		
Area in agriculture:	<u>160</u> <del>acres</del> within 2 km of Monsanto		
Location description:	<u>East of Plant</u>		
Township:	<u>8S</u> <u>9S</u>	Range:	<u>42E</u>
		Section (nearest 1/4 1/4)	<u>part of Section 33</u>
<b>RESIDENT/LAND USER INFORMATION</b>		8S 42E	33
How long has the property been in current ownership:	<u>Since 1965</u>	9S 42E	4
List previous owner(s)/date(s) of sale:	<u><del>Person</del> Claude Jepson</u>		
Number/ ages of people residing on property:	<u>none</u>		
Length of residency per year (seasonal or year-round):	<u>NA</u>		
How many people work on property but reside elsewhere:	<u>no</u>		
Daily hours:	<u>NA</u>		
Number of days/year:			
Seasons of work:			
<b>EXPECTED FUTURE LAND USES</b>			
<u>hope to sell 1993</u>			
<b>OTHER LAND USE COMMENTS</b>			
<u>CRP - <del>not</del> until 1997 (federal program subsidized to not grow any crops, they plant grass seeds + let the land go for 10 years)</u>			
<b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>			
<u>no photo</u>			



CROP PRODUCTION

CRP Land

Type of Crop	Quantity	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
Water Sources, If Irrigated:					
Describe crop rotation schedule:					

## LIVESTOCK

no livestock

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources
Describe where livestock are sold or shipped, and for what purpose:						
<b>Livestock Movement</b>						
Are livestock moved to other properties throughout the year, if so describe other locations:						
How long are each type of livestock kept at this location:						
What seasons of the year at this location:						
<b>Livestock Products</b>						
Describe commercial products (e.g., meat, wool, other) produced by livestock:						
Describe livestock products (e.g., eggs, meat, dairy) used by property residents:						

PROPERTY DESCRIPTION		547-3261
Name of property owner:	Clarke Brown	
Name of property manager/tenant:	Same	
Property address:	no address	
Property area:	280 acres (~180 acres within 2k of Monsanto)	
Area in agriculture:	208 acres (only 80-100 acres farmable within 2km of Monsanto)	
Location description:	North-northeast of Plant	
Township:	85	Range: 42E Section (nearest 1/4 1/4)
RESIDENT/LAND USER INFORMATION		part of Section 20 (~western half eastern)
How long has the property been in current ownership:		20 years (since 1973)
List previous owner(s)/date(s) of sale:		Don Panting
Number/ ages of people residing on property:		none
Length of residency per year (seasonal or year-round):		NA
How many people work on property but reside elsewhere:		1- Clarke Brown
Daily hours:	480 hrs / yr	
Number of days/year:		
Seasons of work:	Spring, summer, fall	
EXPECTED FUTURE LAND USES		Same
OTHER LAND USE COMMENTS		most of the property within 2km of Monsanto consists of non-farmable Three mile Knoll hill. Not used for cattle grazing.
PHOTOGRAPH NUMBERS AND DESCRIPTIONS		Roll 1, #9 looking southwest, taken from Hwy 34

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator

harrow

fertilize + seed

What time(s) of year is the soil prepared for planting:

May

How many man-hours are spent preparing soil:

~50 hrs/yr

How deep is the soil tilled:

4 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
NH <sub>3</sub> - Anhydrous	70 units/acre	50 hrs/yr	ground applicator
2-4D	6oz/acre		airplane

fertilizer:  
herbicides

CROP PRODUCTION

Type of Crop	bushey acre Quantity	Number of Acres Used	Growing Season	Irrigation Used?	Where is Produce Sold or Sent?
barley - feed	50-60	208	May-Sept	NO	various elevators
Wheat		9093			
Water Sources, if irrigated:					
NA					
Describe crop rotation schedule:					
3-4 years crop / one fallow / 3-4 years of different crop					

or

## LIVESTOCK

~~no livestock~~

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources
horses	2	?	5 acres	grass, hay	his farm	?

Describe where livestock are sold or shipped, and for what purpose:

NA

## Livestock Movement

Are livestock moved to other properties throughout the year, if so describe other locations:

no

How long are each type of livestock kept at this location:

year round

What seasons of the year at this location:

year round

## Livestock Products

Describe commercial products (e.g., meat, wool, other) produced by livestock:

NA

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

NA

## PROPERTY DESCRIPTION

Name of property owner:

Clarke Brown

Name of property manager/tenant:

Same

Property address:

no address

Property ID:

5B

Date:

6/9/93

Surveyor:

Upkes

Property area:

280 acres 240 280 ac

Area in agriculture:

280 acres 240 acre

Location description:

Immediately east + northeast of Plant

Township:

8S

Range:

42E

Section (nearest 1/4 1/4)

part of Sections

29 + 32

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

Since 1986

List previous owner(s)/date(s) of sale:

Law Estate

Number/ ages of people residing on property:

none

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

1 - Clarke Brown

Daily hours:

2-3 months / yr (480 hrs / yr)

Number of days/year:

Seasons of work:

Spring,

## EXPECTED FUTURE LAND USES

Same (zoned Industrial)

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll #1, #4

north-  
looking west from <sup>corner</sup> Panting Lane +  
Trail Canyon Rd

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator,  
harrower  
fertilizer + seeding drill

What time(s) of year is the soil prepared for planting:

May

How many man-hours are spent preparing soil:

~ 50 hrs / yr

How deep is the soil tilled:

4 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Type or Trade Name	Quantity Applied per Year	Number of Man-Hours/ Application	Application Method
fertilizer: Anhydrous Ammonia	* 70 units/acre	50 hrs / yr	ground applicator
herbicide: 2-4 D	600/acre	?	airplane

\* 70 units/acre



## LIVESTOCK

Type of Livestock	Quantity	Ages	Number of Acres Used	Types of Feed Used	Feed Sources	Water Sources

Describe where livestock are sold or shipped, and for what purpose:

**Livestock Movement**  
Are livestock moved to other properties throughout the year, if so describe other locations:

How long are each type of livestock kept at this location:

What seasons of the year at this location:

**Livestock Products**  
Describe commercial products (e.g., meat, wool, other) produced by livestock:

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

## PROPERTY DESCRIPTION

Name of property owner:

Lilly + ✓

Ira Ellis - 547-3540

Name of property manager/tenant:

Property address:

Property ID:

6

Date:

Surveyor:

Property area:

360 acres (~260 acres

within 2km of Monsanto

Area in agriculture:

~~~110 acres~~ 200-160

Location description:

~280 acres (~100 acres within 2km of Monsanto)

acres north of Monsanto Plant

Township: 85 Range: 42E Section (nearest 1/4 1/4)

parts of  
Sections 29, 20

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

Since 1963

List previous owner(s)/date(s) of sale:

Deaton

Number/ ages of people residing on property:

none

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

none

Daily hours:

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

CRP land until 1997 - land dormant for  
10 years, grows grass

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 1, #10 looking south from ~~boundary of~~  
~~Section 17~~ middle of NW corner  
of Section 20.



## CROP PRODUCTION

CRP land

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
| barley                           |          |                      |                |                  |                                |
| fall wheat                       |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

no: livestock

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

|                                                                      |                                     |                                                     |
|----------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------|
| <b>PROPERTY DESCRIPTION</b> (no phone)                               |                                     |                                                     |
| Name of property owner:                                              | Thomas Cellan - <del>547-2291</del> | Property ID: 7                                      |
| Name of property manager/tenant:                                     | Lonnie Cellan - 547-2291            | Date: 6/8/93                                        |
| Property address:                                                    | no address                          | Surveyor: Yates                                     |
| Property area:                                                       | 400 acres 80 acre                   |                                                     |
| Area in agriculture:                                                 | 44 acres                            |                                                     |
| Location description:                                                | northeast of Monsanto Plant         |                                                     |
| Township: 8S                                                         | Range: 42E                          | Section (nearest 1/4 1/4) parts of Sections 29 + 20 |
| <b>RESIDENT/LAND USER INFORMATION</b>                                |                                     |                                                     |
| How long has the property been in current ownership:<br>~ since 1950 |                                     |                                                     |
| List previous owner(s)/date(s) of sale:                              |                                     |                                                     |
| don't know (per Lonnie Cellan)                                       |                                     |                                                     |
| Number/ ages of people residing on property:                         |                                     |                                                     |
| 1 - Thomas Cellan (probably ~70 - didn't answer question)            |                                     |                                                     |
| Length of residency per year (seasonal or year-round):               |                                     |                                                     |
| year round                                                           |                                     |                                                     |
| How many people work on property but reside elsewhere:               |                                     |                                                     |
| 1 - Lonnie Cellan                                                    |                                     |                                                     |
| Daily hours:                                                         | 4 hrs / week                        |                                                     |
| Number of days/year:                                                 |                                     |                                                     |
| Seasons of work:                                                     | Spring, Summer, Fall                |                                                     |
| <b>EXPECTED FUTURE LAND USES</b>                                     |                                     |                                                     |
| same                                                                 |                                     |                                                     |
| <b>OTHER LAND USE COMMENTS</b>                                       |                                     |                                                     |
| <b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>                           |                                     |                                                     |
| Roll 1, #7 looking to the south-southwest from Highway 34            |                                     |                                                     |

## CROP PRODUCTION

| Type of Crop                                   | bushel<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where is<br>Produce<br>Sold or Sent? |
|------------------------------------------------|----------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| Wheat                                          | *                          | 44                      | May-Aug           | dry                 | *                                    |
| or<br>barley                                   |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
| Water Sources, If Irrigated:                   |                            |                         |                   |                     |                                      |
| NA                                             |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
| Describe crop rotation schedule:               |                            |                         |                   |                     |                                      |
| usually grows barley, rotates w/ summer fallow |                            |                         |                   |                     |                                      |
| + wheat                                        |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |
|                                                |                            |                         |                   |                     |                                      |

\* Information private, does not want information known.

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

Cultivator  
harrow  
seed

What time(s) of year is the soil prepared for planting:

spring

How many man-hours are spent preparing soil:

~ 3 hrs/yr

How deep is the soil tilled:

6-8 inch

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
| Anhydrous          | 60 units/yr               | 2 hrs/yr                         | ground applicator  |
| 2-4b               | ?                         |                                  | } spray truck      |
| Curtauh            | ?                         |                                  |                    |
| MCPA               | ?                         |                                  |                    |
| Fargo (Monsanto)   |                           |                                  |                    |

depends on what kinds of weeds they have in a certain year.

NC - no comment

LIVESTOCK

| Type of Livestock                                                                                                          | Quantity | Ages  | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------------------------------------|----------|-------|----------------------|--------------------|--------------|---------------|
| cow                                                                                                                        | 100      | NA NC | ~10                  | hay                | NA NC        | Well &        |
| horses                                                                                                                     | 30       | NA NC | ↓                    | .                  | NA NC        | Formation     |
| pig                                                                                                                        | 10       | NA NC | ↓                    | ?                  | NA NC        | Spring        |
|                                                                                                                            |          |       |                      |                    |              |               |
|                                                                                                                            |          |       |                      |                    |              |               |
|                                                                                                                            |          |       |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:<br>no comment                                          |          |       |                      |                    |              |               |
| Livestock Movement                                                                                                         |          |       |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations:<br>moved during summer months |          |       |                      |                    |              |               |
| How long are each type of livestock kept at this location:<br>cows - 6 months<br>horses - 6 months                         |          |       |                      |                    |              |               |
| What seasons of the year at this location:<br>cows - winter<br>horses - winter                                             |          |       |                      |                    |              |               |
| Livestock Products                                                                                                         |          |       |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:<br>cows - meat<br>pig - meat                 |          |       |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:<br>NA                                    |          |       |                      |                    |              |               |
|                                                                                                                            |          |       |                      |                    |              |               |
|                                                                                                                            |          |       |                      |                    |              |               |

547-4929

## PROPERTY DESCRIPTION

Name of property owner:

Kelley Wheeler

Name of property manager/tenant:

Opal Anderson

Property address:

same

1956 W Hwy 34

Property area:

~~10 acres~~ 6

Area in agriculture:

~~10 acres~~ (farm) ??

Location description:

3 acres

Property ID:

8

Date:

6/8/93

Surveyor:

Upates

Township: 8S Range: 42E Section (nearest 1/4 1/4)

29 SW 1/4 of NE 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

1 year since 1992

List previous owner(s)/date(s) of sale:

Opal Andersen

Number/ ages of people residing on property:

5 / 5, 8, 16 + (2 adults)

Length of residency per year (seasonal or year-round):

year round

How many people work on property but reside elsewhere:

NA

Daily hours:

NA

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

photo #2



## CROP PRODUCTION

No farmland

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages           | Number of Acres Used | Types of Feed Used | Feed Sources     | Water Sources |
|----------------------------------------------------------------------------------------------|----------|----------------|----------------------|--------------------|------------------|---------------|
| horses                                                                                       | 2        | 3 months, 1 yr | 3                    | grass              |                  |               |
|                                                                                              |          |                |                      | winter - hay       | Jack Christensen | Well          |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| <b>Livestock Movement</b>                                                                    |          |                |                      |                    |                  |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| How long are each type of livestock kept at this location:                                   |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| What seasons of the year at this location:                                                   |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| <b>Livestock Products</b>                                                                    |          |                |                      |                    |                  |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |
|                                                                                              |          |                |                      |                    |                  |               |

## PROPERTY DESCRIPTION

Name of property owner: Larry HopkinsName of property manager/tenant: sameProperty address: Highway 34  
Soda Spring IDProperty area: ~ 220 acresArea in agriculture: ~ 180 acresLocation description: Immediately east of Monsanto PlantProperty ID: 9Date: 6/7/93Surveyor: UatesTownship: 8S Range: 42E Section (nearest 1/4 1/4): 9S

parts of Sections

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership: Since 1985T8S R42E 32  
T9S R42E 5List previous owner(s)/date(s) of sale: Vernal Hopkins - 1930'sNumber/ ages of people residing on property: noneLength of residency per year (seasonal or year-round): NAHow many people work on property but reside elsewhere: 1 - Larry HopkinsDaily hours: 90 ~ 100 hrs / yearNumber of days/year: ~ 14 days / yearSeasons of work: Spring, Summer, Fall

## EXPECTED FUTURE LAND USES

NO same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS Northwest

Roll 1, # 2 looking North from Evergreen Reservoir  
towards Monsanto

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator, weeder, fertilize + seed

What time(s) of year is the soil prepared for planting:

Spring - planted 1/2 land is summer fallowed  
fall - harvest

How many man-hours are spent preparing soil:

30 hrs seeding  
30 hrs summer fallow  
30 hrs harvest

How deep is the soil tilled:

6 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
| Ammonium           | 2.5 tons                  | 10 hrs / yr                      | ground applicator  |
| 2-4 D              | 3 qals                    | 5 <del>hrs</del> hrs / yr        | spray truck        |
| Banville           | 1 qt                      |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |

Fertilizer.  
herbicides {

nitrites

## CROP PRODUCTION

| Type of Crop                     | bushels/<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where Is<br>Produce<br>Sold or Sent? |
|----------------------------------|------------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| wheat                            | 40 bushels                   | ~180                    | May-Aug           | NO                  | Soda Spring Elevator                 |
| <del>barley</del>                |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
| Water Sources, If Irrigated:     |                              |                         |                   |                     |                                      |
| NA                               |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
| Describe crop rotation schedule: |                              |                         |                   |                     |                                      |
| summer fallow                    |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |
|                                  |                              |                         |                   |                     |                                      |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

## PROPERTY DESCRIPTION

Name of property owner: Laurie + Curtis Lish  
Name of property manager/tenant: same  
Property address: 1977 Panting Lane  
Soda Springs ID

Property ID: 10  
Date: 6/8/93  
Surveyor: Yates

Property area: 13 acre  
Area in agriculture: 5 pasture - horses  
Location description: 5 alfalfa + grass mixture  
northeast of Monsanto Plant

Township: 8S Range: 42E Section (nearest 1/4 1/4) 29 NE 1/4 of NE 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:  
since 1990

List previous owner(s)/date(s) of sale:

Van Garner

Number/ ages of people residing on property:

5 / 38, 36, 13, 11, 9

Length of residency per year (seasonal or year-round):

year round

How many people work on property but reside elsewhere:

NA

Daily hours:

NA

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

no photos - decp



## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator  
harrow  
seed

What time(s) of year is the soil prepared for planting:

April or May

How many man-hours are spent preparing soil:

30 hrs / yr

How deep is the soil tilled:

6-6 inch

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
| *                  |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |

\* no fertilizer or herbicides used

## LIVESTOCK

| Type of Livestock | Quantity | Ages | Number of Acres Used | Types of Feed Used     | Feed Sources | Water Sources |
|-------------------|----------|------|----------------------|------------------------|--------------|---------------|
| horses            | 4-5      | 4-17 | 5                    | alfalfa hay<br>+ grass | their farm   | well water    |
|                   |          |      |                      |                        |              |               |
|                   |          |      |                      |                        |              |               |
|                   |          |      |                      |                        |              |               |
|                   |          |      |                      |                        |              |               |
|                   |          |      |                      |                        |              |               |
|                   |          |      |                      |                        |              |               |

Describe where livestock are sold or shipped, and for what purpose:

NA

## Livestock Movement

Are livestock moved to other properties throughout the year, if so describe other locations:

NO

How long are each type of livestock kept at this location:

year round

What seasons of the year at this location:

year round

## Livestock Products

Describe commercial products (e.g., meat, wool, other) produced by livestock:

NA

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

NA

## PROPERTY DESCRIPTION

Name of property owner: Owen J. Garner (Jay Garner)

Name of property manager/tenant: \_\_\_\_\_

Property address: 1997 Panting Lane  
Soda SpringsProperty ID: 11Date: 6/7/93Surveyor: YatesProperty area: 12 1/2 ~~acres~~ acresArea in agriculture: 12 ~~acres~~ acres (sheep grazing) + houseLocation description: northeast of PlantTownship: 8S Range: 42E Section (nearest 1/4 1/4)29 NE 1/4 of NE 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

20 year

List previous owner(s)/date(s) of sale:

Morgan Levitt - decease

Number/ ages of people residing on property:

2 / 65, 61

Length of residency per year (seasonal or year-round):

year - round

How many people work on property but reside elsewhere:

noneDaily hours: NA

Number of days/year: \_\_\_\_\_

Seasons of work: \_\_\_\_\_

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 1, #6 looking southeast from northwest corner of property



## CROP PRODUCTION

no farmland

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources     | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|------------------|---------------|
| sheep                                                                                        | 20       | NA   | 12                   | hay, grass         | Jack Christensen | well          |
| lamb                                                                                         | 25       | NA   | same                 |                    |                  |               |
| cattle *                                                                                     | ?        |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |                  |               |
| Idaho Falls + Preston - meat + wool                                                          |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| Livestock Movement                                                                           |          |      |                      |                    |                  |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |                  |               |
| no                                                                                           |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |                  |               |
| year-round                                                                                   |          |      |                      |                    |                  |               |
| <del>2-4-95</del>                                                                            |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| Livestock Products                                                                           |          |      |                      |                    |                  |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |                  |               |
| meat                                                                                         |          |      |                      |                    |                  |               |
| wool                                                                                         |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |
|                                                                                              |          |      |                      |                    |                  |               |

\* doesn't have any cattle now but might in the future depending on prices

## PROPERTY DESCRIPTION

547-4641

Name of property owner:

Jack Christensen

Property ID:

12

Name of property manager/tenant:

Same

Date:

6/8/93

Property address:

1690 Panting Lane

Surveyor:

Uates

Soda Springs

Property area:

~480 acres (~280 acres within

2km of Monsanto)

Area in agriculture:

~480 acres (~280 acres with

2km of Monsanto)

Location description:

420 acres

northeast of Monsanto Plant

Township:

85

Range:

42E

Section (nearest 1/4 1/4)

parts of sections

21, 28 + 29

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

since 1989

List previous owner(s)/date(s) of sale:

Don Panting, Dale Panting, + Marjorie Birds

Jack Christensen bought it from the Nature Conservancy

Number/ ages of people residing on property:

2 houses (1 trailer) 6 people / 39, 38, 14, 12, 11, 6

renters: 2 people / ~25, 26

Length of residency per year (seasonal or year-round):

year round

How many people work on property but reside elsewhere:

1-Jack Christensen

Daily hours:

1920 hrs/yr for all 480 acres

Number of days/year:

Seasons of work:

all seasons

(~1130 hrs/yr for  
the acres within  
2km of Monsanto)

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 1, # 8 looking South from road along center  
of boundary between sections 21 + 28

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

Chisel plow - Fall

Cultivated + harrowed in Spring

What time(s) of year is the soil prepared for planting:

May

How many man-hours are spent preparing soil:

100 hr/year in spring } for all 480 acres (~60 hrs/yr in spring } for acreage  
 100 hr/year in fall } (~60 hrs/yr in fall } with 2km  
 of margin)

How deep is the soil tilled:

10-14 inches chisel plow

3-6 inches cultivator

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name   | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method   |
|----------------------|---------------------------|----------------------------------|----------------------|
| fertilizer Anhydrous | 100 units                 | 2 40 hrs/yr                      | ground applicator    |
| dry fertilizer *     | 20 units                  | ~25 hrs/yr for acres within 2km  |                      |
| herbicide 2-4D       | ?                         | ?                                | crop duster airplane |
| Farago               |                           |                                  |                      |

\* pot ash, sulfur, phosphate, + nitrogen

CROP PRODUCTION

| Type of Crop                     | bushel/<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where is<br>Produce<br>Sold or Sent? |
|----------------------------------|-----------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| alfalfa hay                      | 2.5 tons/acre               | 40                      | May-Aug           | yes *               | USE IT or sell                       |
| wheat                            | 70                          | 70                      | ↓                 | yes *               | B+J Elevators (Raley ID?)            |
| barley - feed                    | 100                         | 150                     | ↓                 | yes *               | or Soda Springs Elevator             |
|                                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
| Water Sources, If Irrigated:     |                             |                         |                   |                     |                                      |
| Formations Springs               |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
| Describe crop rotation schedule: |                             |                         |                   |                     |                                      |
| every 5-7 years                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |
|                                  |                             |                         |                   |                     |                                      |

\* all but 10 acres

locally in Soda Springs  
B+J Elevators (Raley ID?)  
or Soda Springs Elevator

## LIVESTOCK

2-10

| Type of Livestock | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources    |
|-------------------|----------|------|----------------------|--------------------|--------------|------------------|
| beef cattle       | 150      | 0-10 | 1-2                  | alfalfa hay        | grow         | Formation Spring |
| horses            | 4        | 6-11 | 20                   | winter - hay       |              | + well water     |
|                   |          |      |                      | summer - grass     |              | from house       |
|                   |          |      |                      |                    |              |                  |
|                   |          |      |                      |                    |              |                  |
|                   |          |      |                      |                    |              |                  |
|                   |          |      |                      |                    |              |                  |

Describe where livestock are sold or shipped, and for what purpose:

cattle - anywhere in the country - Idaho, Nebraska / beef

## Livestock Movement

Are livestock moved to other properties throughout the year, if so describe other locations:

cattle kept near Graze Lake, ID May - Sept

Cattle are kept on property in winter only (Nov - May)

How long are each type of livestock kept at this location:

6 month

What seasons of the year at this location:

winter

## Livestock Products

Describe commercial products (e.g., meat, wool, other) produced by livestock:

meat

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

none

## PROPERTY DESCRIPTION

Name of property owner: Kerr-McGee (on-site) Property ID: 13  
Name of property manager/tenant: Larry Hopkins Date: 6/7/93  
Property address: 1864 Highway 34 Surveyor: Yates  
Soda Springs ID  
  
Property area: 320 acres  
Area in agriculture: 70 acres farmed + 160 acres in CRP  
Location description: east of Monsanto Plant

Township: 8S Range: 42E Section (nearest 1/4 1/4) parts of sections  
32 + 33

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:  
Since ~1959

List previous owner(s)/date(s) of sale:

possibly Blackburn

Number/ ages of people residing on property:

no

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere: (work on the farmland)

1 - Larry Hopkins

Daily hours:

50 hrs / year

Number of days/year:

Seasons of work:

Spring, Summer, Fall

## EXPECTED FUTURE LAND USES

no different than present

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 2, # 17 looking South-Southeast from  
Trail Canyon Road towards Kerr-McGee

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator, weeder, fertilize + seed

What time(s) of year is the soil prepared for planting:

Spring

How many man-hours are spent preparing soil:

20 hrs / year

How deep is the soil tilled:

6 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
| Anhydrous Ammonia  | 3 tons                    | 10 hr / yr                       | ground applicator  |
| 2-4D               | 3 gal                     | } 5 hr / yr                      | } spray truck      |
| Banville           | 1 qt                      |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |

fertilizer  
erbicide }

## CROP PRODUCTION

| Type of Crop                     | bushel<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where Is<br>Produce<br>Sold or Sent? |
|----------------------------------|----------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| barley<br>CRP                    | 40                         | 70<br>60                | May-Aug           | no                  | Soda Springs Elevator                |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
| Water Sources, If Irrigated:     |                            |                         |                   |                     |                                      |
| NA                               |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
| Describe crop rotation schedule: |                            |                         |                   |                     |                                      |
| summer fallow                    |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |
|                                  |                            |                         |                   |                     |                                      |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

# PROPERTY DESCRIPTION

Name of property owner: Monsanto (on-site)  
 Name of property manager/tenant: Larry Hopkins  
 Property address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Property ID: 14  
 Date: 10/7/93  
 Surveyor: Uates

Property area: ~560 acres (Monsanto Plant)  
 Area in agriculture: ~30 acres  
 Location description: \_\_\_\_\_

located along the eastern boundary of the Plant

Township: 8S Range: 42E Section (nearest 1/4 1/4) 32 NW 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:  
since ~1952

List previous owner(s)/date(s) of sale:

possibly Vernal Hopkins (or Blackburn)

Number/ ages of people residing on property:

none

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

1 - Larry Hopkins

Daily hours:

30 hrs

Number of days/year:

Seasons of work:

spring, summer, fall

## EXPECTED FUTURE LAND USES

land may be used in the future (possibly as soon as 1994) by Monsanto for purposes other than farming (per Larry Hopkins)

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 2, #16 (looking southwest from Highway 34)

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator, weeder, fertilize + seed.

What time(s) of year is the soil prepared for planting:

Spring

How many man-hours are spent preparing soil:

10 hr/yr

How deep is the soil tilled:

6"

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name            | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|-------------------------------|---------------------------|----------------------------------|--------------------|
| Fertilizer: Anhydrous Ammonia | 1 ton                     | 5 hr/yr                          | ground applicator  |
| erbicides: 2-4D               | 1 gal                     | } 1 hr/yr                        | } spray truck      |
| Barville                      | 1 pt                      |                                  |                    |
|                               |                           |                                  |                    |
|                               |                           |                                  |                    |
|                               |                           |                                  |                    |

## CROP PRODUCTION

| Type of Crop                            | bushels<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where is<br>Produce<br>Sold or Sent? |
|-----------------------------------------|-----------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| barley                                  | 40                          | 30                      | May-Aug           | no                  | Soda Springs Elevator                |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
| <b>Water Sources, If Irrigated:</b>     |                             |                         |                   |                     |                                      |
| NA                                      |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
| <b>Describe crop rotation schedule:</b> |                             |                         |                   |                     |                                      |
| summer fallow                           |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |
|                                         |                             |                         |                   |                     |                                      |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

|                                                        |                                                        |                    |
|--------------------------------------------------------|--------------------------------------------------------|--------------------|
| <b>PROPERTY DESCRIPTION</b>                            |                                                        |                    |
| Name of property owner:                                | 547-3966<br>Christman + Hopkins (?)                    | Property ID: 15    |
| Name of property manager/tenant:                       |                                                        | Date:              |
| Property address:                                      |                                                        | Surveyor: Utes     |
| Property area:                                         | <del>~ 250 acres</del> 440 (300 with 2 km of Monsanto) |                    |
| Area in agriculture:                                   | <del>~ 250 acres</del>                                 |                    |
| Location description:                                  | East of Plant                                          |                    |
| Township:                                              | 8S Range: 42E Section (nearest 1/4 1/4)                | most of section 33 |
| RESIDENT/LAND USER INFORMATION                         | 8S 42E 33<br>9S 42E 4                                  | NW 1/4             |
| How long has the property been in current ownership:   |                                                        |                    |
| List previous owner(s)/date(s) of sale:                |                                                        |                    |
| Number/ ages of people residing on property:           |                                                        |                    |
| Length of residency per year (seasonal or year-round): |                                                        |                    |
| How many people work on property but reside elsewhere: |                                                        |                    |
| Daily hours:                                           |                                                        |                    |
| Number of days/year:                                   |                                                        |                    |
| Seasons of work:                                       |                                                        |                    |
| <b>EXPECTED FUTURE LAND USES</b>                       |                                                        |                    |
| <b>OTHER LAND USE COMMENTS</b>                         |                                                        |                    |
| <b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>             |                                                        |                    |
| Roll 1, # 3 looking South from Trail Canyon Road       |                                                        |                    |

17 14:46 x 13:34 x  
 18 10:25 x 15:06 +  
 19 12:36 x 18:00 x  
 20 19:40 x

## AGRICULTURAL PRACTICES

**Describe how the ground is prepared for planting (e.g., machinery used):**

**What time(s) of year is the soil prepared for planting:**

**How many man-hours are spent preparing soil:**

**How deep is the soil tilled:**

**FERTILIZERS/PESTICIDES/HERBICIDES**

**List the fertilizers, pesticides, and herbicides used on the property:**

[illegible]

## CROP PRODUCTION

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

|                                                                                                                 |                        |
|-----------------------------------------------------------------------------------------------------------------|------------------------|
| PROPERTY DESCRIPTION (farmed as part of Property # <sup>24</sup> 26)                                            |                        |
| Name of property owner: <u>Mark III Inc.</u>                                                                    | Property ID: <u>16</u> |
| Name of property manager/tenant: <u>Harry Dean Ozburn</u>                                                       | Date: <u>6/7/93</u>    |
| Property address: _____                                                                                         | Surveyor: <u>Gates</u> |
| Property area: <u>~15 acres</u>                                                                                 |                        |
| Area in agriculture: <u>~15 acres</u>                                                                           |                        |
| Location description: <u>South of Monsanto Plant</u>                                                            |                        |
| Township: <u>9S</u> Range: <u>42E</u> Section (nearest 1/4 1/4): <u>6 SE 1/4 of NE 1/4</u>                      |                        |
| RESIDENT/LAND USER INFORMATION                                                                                  |                        |
| How long has the property been in current ownership: <u>no info (per Harry Dean Ozburn)</u>                     |                        |
| List previous owner(s)/date(s) of sale: <u>Lau Estates +</u><br><u>Elwin Lau</u>                                |                        |
| Number/ ages of people residing on property: <u>none</u>                                                        |                        |
| Length of residency per year (seasonal or year-round): <u>NA</u>                                                |                        |
| How many people work on property but reside elsewhere: <u>5 - Ozburn Farms (Harry Dean Ozburn + his 4 sons)</u> |                        |
| Daily hours: <u>~10 hrs/year</u>                                                                                |                        |
| Number of days/year: _____                                                                                      |                        |
| Seasons of work: _____                                                                                          |                        |
| EXPECTED FUTURE LAND USES                                                                                       |                        |
| <u>eventually developed as business property</u><br><u>by Mark III (subcontractor to Monsanto)</u>              |                        |
| OTHER LAND USE COMMENTS                                                                                         |                        |
| PHOTOGRAPH NUMBERS AND DESCRIPTIONS                                                                             |                        |
| <u>Roll 2, #19, looking south from north border</u>                                                             |                        |

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

What time(s) of year is the soil prepared for planting:

How many man-hours are spent preparing soil:

How deep is the soil tilled:

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |

included as part of property #2624  
 farmed along with Elwin Lau's adjoining property  
 by Orburn Farms

## CROP PRODUCTION

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

See Property # ~~24~~ 241

## LIVESTOCK

no livestock

| Type of Livestock | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|-------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                   |          |      |                      |                    |              |               |
|                   |          |      |                      |                    |              |               |
|                   |          |      |                      |                    |              |               |
|                   |          |      |                      |                    |              |               |
|                   |          |      |                      |                    |              |               |
|                   |          |      |                      |                    |              |               |

Describe where livestock are sold or shipped, and for what purpose:

**Livestock Movement**  
Are livestock moved to other properties throughout the year, if so describe other locations:

How long are each type of livestock kept at this location:

What seasons of the year at this location:

**Livestock Products**  
Describe commercial products (e.g., meat, wool, other) produced by livestock:

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

## PROPERTY DESCRIPTION

Name of property owner: Monsanto (off-site)  
Name of property manager/tenant: Larry Hopkins  
Property address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Property ID: 17  
Date: 6/7/93  
Surveyor: Uates

Property area: 400 acres  
Area in agriculture: ~120 acres (5 acres for horses)  
Location description: Southwest of Monsanto Plant

Township: T9S Range: R42E Section (nearest 1/4 1/4) (6 NW) 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:  
since 1988

List previous owner(s)/date(s) of sale:

Evan Kackley (Doc Kackley Spring property)

Number/ ages of people residing on property:  
none

Length of residency per year (seasonal or year-round):  
NA

How many people work on property but reside elsewhere:  
1 - Larry Hopkins

Daily hours: 300 hrs / year  
Number of days/year: \_\_\_\_\_  
Seasons of work: Spring, Summer, Fall

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

Cattle use in the past - 80 acres available for pasture land. May have cattle in the future - depends on prices of each year.

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 2, # 23 A) looking south from road (horses)  
B) looking north from 4th St (Homestead Spring)  
C) looking east (Hans Ranch) prop)  
D) Mountain Side - looking southwest from corner of cp't Rd.

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

Cultivator, weeder, fertilizer + seed

What time(s) of year is the soil prepared for planting:

May

How many man-hours are spent preparing soil:

30 hrs/yr

How deep is the soil tilled:

6 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

Fertilizer:  
herbicides {

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method |
|--------------------|---------------------------|----------------------------------|--------------------|
| Anhydrous Ammonia  | 3 tons                    | 10 hrs/yr                        | ground applicator  |
| 2-4-D              | 3 gal                     | 5 hrs/yr                         | spray truck        |
| Banville           | 1 qt                      |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |
|                    |                           |                                  |                    |

SENT BY: SEATTLE

6-4-93 : 1:54PM :

**GOLDER ASSOCIATES-**

20854-2312: 5: 5

## LIVESTOCK

| Type of Livestock | Quantity | Ages     | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|-------------------|----------|----------|----------------------|--------------------|--------------|---------------|
| horses            | 3        | 13, 8, 4 | 5                    | grass, hay         | pasture land | Soda Creek    |
|                   |          |          |                      |                    |              |               |
|                   |          |          |                      |                    |              |               |
|                   |          |          |                      |                    |              |               |
|                   |          |          |                      |                    |              |               |
|                   |          |          |                      |                    |              |               |
|                   |          |          |                      |                    |              |               |

Describe where livestock are sold or shipped, and for what purpose:

NA

## Livestock Movement

Are livestock moved to other properties throughout the year, if so describe other locations:

Nov - March horses are kept ~~in a small~~ in a ~~small~~ small pasture & feed hay

How long are each type of livestock kept at this location:

~ 5 months

What seasons of the year at this location:

winter

## Livestock Products

Describe commercial products (e.g., meat, wool, other) produced by livestock:

NA

Describe livestock products (e.g., eggs, meat, dairy) used by property residents:

NA

## PROPERTY DESCRIPTION

Name of property owner: Tammy & Morris Cole - 547-3420Name of property manager/tenant: sameProperty address: no addressProperty area: 80 acresArea in agriculture: 80 acres

Location description:

Immediately west of Monsanto PlantTownship: 8S Range: 42E Section (nearest 1/4 1/4)31 part of  
SW 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

Since 1989

List previous owner(s)/date(s) of sale:

Merle Cellan

Number/ ages of people residing on property:

none

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

NA

Daily hours:

NA

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

## OTHER LAND USE COMMENTS

Tammy is Merle Cellan's daughter. She also  
farms LDS church land to the north

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 2, #14, looking NW from SE corner of  
property. Shows Merle Cellan's property  
in background.

## CROP PRODUCTION

no farmland

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## AGRICULTURAL PRACTICES

no farm land

Describe how the ground is prepared for planting (e.g., machinery used):

**What time(s) of year is the soil prepared for planting:**

How many man-hours are spent preparing soil:

**How deep is the soil tilled:**

**FERTILIZERS/PESTICIDES/HERBICIDES**

**List the fertilizers, pesticides, and herbicides used on the property:**

[illegible]



## PROPERTY DESCRIPTION

(Lewis Well)

Name of property owner:

Delvin Humble - 547-4707

Property ID:

19

27

Name of property manager/tenant:

same

Date:

6/7/93

Property address:

540 E. 480 North

Surveyor:

Lukes

Soda Spring ID

Property area:

10 ~~48~~ acres

Area in agriculture:

8 ~~48~~ acres (horses - farm land)

Location description:

South of Monsanto Plant

Township:

9S

Range:

42E

Section (nearest 1/4 1/4)

6 NE 1/4 of SE 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

2 years

List previous owner(s)/date(s) of sale:

Larry + Sandra Lewis / Sept. 1991

Number/ ages of people residing on property:

8 people

40, 37, 16, 15, 13, 11, 8, 5

(87 year old - 6 months/yr)

Length of residency per year (seasonal or year-round):

year round

(87 year old / 6 months/yr)

How many people work on property but reside elsewhere:

none

Daily hours:

NA

Number of days/year:

NA

Seasons of work:

NA

## EXPECTED FUTURE LAND USES

pasture - the crop land in front of the house is being converted to pasture in a month

## OTHER LAND USE COMMENTS

none

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

Roll 2 #18

none looking west



## CROP PRODUCTION

no farmland

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                                                                     | Quantity | Ages        | Number of Acres Used | Types of Feed Used | Feed Sources   | Water Sources |
|---------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|----------------------|--------------------|----------------|---------------|
| horse                                                                                                                                 | 4        | 20, 8, 1, 3 | 7.5                  | alfalfa hay        | grain, pasture | well          |
| pigs                                                                                                                                  | 2        | NA          | 0.5                  | store bought       | co-op          | well          |
| chickens                                                                                                                              | 20       | NA          | NA                   | "                  | co-op          | well          |
| rabbits                                                                                                                               | 2        | NA          | NA                   | "                  | co-op          | well          |
|                                                                                                                                       |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| Describe where livestock are sold or shipped, and for what purpose:<br>NA                                                             |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| Livestock Movement<br>Are livestock moved to other properties throughout the year, if so describe other locations:<br>no              |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| How long are each type of livestock kept at this location:<br>livestock is for home use - kept at this location for life of livestock |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| What seasons of the year at this location:<br>NA                                                                                      |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| Livestock Products<br>Describe commercial products (e.g., meat, wool, other) produced by livestock:<br>NA                             |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:<br>eggs, meat (pigs)                                |          |             |                      |                    |                |               |
|                                                                                                                                       |          |             |                      |                    |                |               |

## PROPERTY DESCRIPTION

Name of property owner:

Dagg Lewis Sr. -547-2575

Name of property manager/tenant:

Property address:

Property area:

Area in agriculture:

Location description:

Property ID:

Date:

Surveyor:

Township:

Range:

Section (nearest 1/4 1/4)

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

List previous owner(s)/date(s) of sale:

Number/ ages of people residing on property:

Length of residency per year (seasonal or year-round):

How many people work on property but reside elsewhere:

Daily hours:

Number of days/year:

Seasons of work:

## EXPECTED FUTURE LAND USES

## OTHER LAND USE COMMENTS

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

no photo

## AGRICULTURAL PRACTICES

**Describe how the ground is prepared for planting (e.g., machinery used):**

**What time(s) of year is the soil prepared for planting:**

**How many man-hours are spent preparing soil:**

**How deep is the soil tilled:**

**FERTILIZERS/PESTICIDES/HERBICIDES**

**List the fertilizers, pesticides, and herbicides used on the property:**

[illegible]

## CROP PRODUCTION

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

## PROPERTY DESCRIPTION

547-3570

Name of property owner:

Roger Grigg

Name of property manager/tenant:

Property address:

no address

Property ID:

21

Date:

6/8/93

Surveyor:

Uates

Property area:

9.25 acre

Area in agriculture:

9.25 acre

Location description:

South of Monsanto Plant

Township:

~~88~~  
95

Range:

42 E

Section (nearest 1/4 1/4)

6 SE 1/4 of SE 1/4

## RESIDENT/LAND USER INFORMATION

How long has the property been in current ownership:

2 years since 1990

List previous owner(s)/date(s) of sale:

Diggs Lewis Sr.

Number/ ages of people residing on property:

no

Length of residency per year (seasonal or year-round):

NA

How many people work on property but reside elsewhere:

none

Daily hours:

NA

Number of days/year:

NA

Seasons of work:

NA

## EXPECTED FUTURE LAND USES

same

## OTHER LAND USE COMMENTS

land used to board &amp; graze horses

## PHOTOGRAPH NUMBERS AND DESCRIPTIONS

no photo

no farmland

CROP PRODUCTION

| Type of Crop                     | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|----------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Water Sources, If Irrigated:     |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
| Describe crop rotation schedule: |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |
|                                  |          |                      |                |                  |                                |





SENT BY: SEATTLE

: 6- 4-93 : 1:54PM : GOLDER ASSOCIATES-

2085473312: # 3/ 6

|                                                        |                                      |                            |
|--------------------------------------------------------|--------------------------------------|----------------------------|
| <b>PROPERTY DESCRIPTION</b>                            |                                      | 547-3556                   |
| Name of property owner:                                | Robert Torgensen                     |                            |
| Name of property manager/tenant:                       |                                      |                            |
| Property address:                                      |                                      |                            |
| Property area:                                         | ~ 420 acres                          |                            |
| Area in agriculture:                                   |                                      |                            |
| Location description:                                  | South + south west of Monsanto Plant |                            |
| Township: 9S                                           | Range: 41E                           | Section (nearest 1/4 1/4)  |
| 8S                                                     |                                      | 8S 41E 30 NE 1/4 of SE 1/4 |
| <b>RESIDENT/LAND USER INFORMATION</b>                  |                                      | 9S 41E part of Sect 1      |
| How long has the property been in current ownership:   |                                      |                            |
| List previous owner(s)/date(s) of sale:                |                                      |                            |
| Number/ ages of people residing on property:           |                                      |                            |
| Length of residency per year (seasonal or year-round): |                                      |                            |
| How many people work on property but reside elsewhere: |                                      |                            |
| Daily hours:                                           |                                      |                            |
| Number of days/year:                                   |                                      |                            |
| Seasons of work:                                       |                                      |                            |
| <b>EXPECTED FUTURE LAND USES</b>                       |                                      |                            |
| <b>OTHER LAND USE COMMENTS</b>                         |                                      |                            |
| <b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>             |                                      |                            |
| no photo                                               |                                      |                            |

4/7 10:30x  
14-15-2

6/5 12:37x 15:22 x 19:40x



**CROP PRODUCTION**

| Type of Crop                            | Quantity | Number of Acres Used | Growing Season | Irrigation Used? | Where is Produce Sold or Sent? |
|-----------------------------------------|----------|----------------------|----------------|------------------|--------------------------------|
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
| <b>Water Sources, If Irrigated:</b>     |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
| <b>Describe crop rotation schedule:</b> |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |
|                                         |          |                      |                |                  |                                |

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

|                                                                                                                      |                                                          |                                               |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------|
| <b>PROPERTY DESCRIPTION</b>                                                                                          |                                                          | 547-4668                                      |
| Name of property owner:                                                                                              | Sid Cellan                                               | Property ID: 23                               |
| Name of property manager/tenant:                                                                                     | same                                                     | Date: 6/7/93                                  |
| Property address:                                                                                                    | no address                                               | Surveyor: Yates                               |
| Property area:                                                                                                       | ~ 50 acres (~80 acres within 2km of Monsanto)            |                                               |
| Area in agriculture:                                                                                                 | ~ 45 acres (~25 acres within 2km of Monsanto)            |                                               |
| Location description:                                                                                                | West of Monsanto Plant - on haul road by Monsanto Quarry |                                               |
| Township: T8S                                                                                                        | Range: R41E                                              | Section (nearest 1/4 1/4) SE 1/4 of NW 1/4 25 |
| <b>RESIDENT/LAND USER INFORMATION</b>                                                                                |                                                          |                                               |
| How long has the property been in current ownership:<br>7 years since 1985-86                                        |                                                          |                                               |
| List previous owner(s)/date(s) of sale:<br>Merle Cellan                                                              |                                                          |                                               |
| Number/ ages of people residing on property:<br>none                                                                 |                                                          |                                               |
| Length of residency per year (seasonal or year-round):<br>NA                                                         |                                                          |                                               |
| How many people work on property but reside elsewhere:<br>1 - Sid Cellan                                             |                                                          |                                               |
| Daily hours:                                                                                                         | 50 hrs / year                                            |                                               |
| Number of days/year:                                                                                                 |                                                          |                                               |
| Seasons of work:                                                                                                     | Spring, Summer, Fall                                     |                                               |
| <b>EXPECTED FUTURE LAND USES</b><br>Same                                                                             |                                                          |                                               |
| <b>OTHER LAND USE COMMENTS</b>                                                                                       |                                                          |                                               |
| <b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b><br>Roll 1, #1 looking West from corner of haul road + Government Dam Road |                                                          |                                               |

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

Cultivator  
harrowed  
fertilized + drilled

What time(s) of year is the soil prepared for planting:

April + May

How many man-hours are spent preparing soil:

15 hrs / year

How deep is the soil tilled:

10-12"

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name                                  | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method             |
|-----------------------------------------------------|---------------------------|----------------------------------|--------------------------------|
| fertilizer, herbicides, herbicide Anhydrous Ammonia | 10 tons                   | 4 hrs / yr                       | by applicator - tank w/ shanks |
| 2-4 D                                               | 5 gal                     | 1 hr / yr                        | spray truck                    |
| Curtail *                                           | 10 gal                    | 1 hr / yr                        | spray truck                    |
|                                                     |                           |                                  |                                |
|                                                     |                           |                                  |                                |
|                                                     |                           |                                  |                                |

\* Canadian thistle



no livestock

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Livestock Movement                                                                           |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Livestock Products                                                                           |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |

|                                                                                           |                                                   |
|-------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>PROPERTY DESCRIPTION</b>                                                               |                                                   |
| Name of property owner:                                                                   | Elwin Lau                                         |
| Name of property manager/tenant:                                                          | Harry Dean Ozburn                                 |
| Property address:                                                                         | no address                                        |
| Property area:                                                                            | ~140 acres                                        |
| Area in agriculture:                                                                      | ~140 acres                                        |
| Location description:                                                                     | South of Monsanto Plant                           |
| Township:                                                                                 | 9S Range: 42E Section (nearest 1/4 1/4)           |
| parts of section 6                                                                        |                                                   |
| <b>RESIDENT/LAND USER INFORMATION</b>                                                     |                                                   |
| How long has the property been in current ownership:                                      | ~ 1963 - 1968                                     |
| List previous owner(s)/date(s) of sale:                                                   | Lau Estate (Serril Lau - deceased)                |
| Number/ ages of people residing on property:                                              | home - but no one lives there                     |
| Length of residency per year (seasonal or year-round):                                    | NA                                                |
| How many people work on property but reside elsewhere:                                    | 5 - Ozburn Farms (Harry Dean Ozburn + his 4 sons) |
| Daily hours:                                                                              | 100 hrs / year                                    |
| Number of days/year:                                                                      |                                                   |
| Seasons of work:                                                                          | Summer months                                     |
| <b>EXPECTED FUTURE LAND USES</b>                                                          |                                                   |
| Same in near future + possible city development in the far future (per Harry Dean Ozburn) |                                                   |
| <b>OTHER LAND USE COMMENTS</b>                                                            |                                                   |
| <b>PHOTOGRAPH NUMBERS AND DESCRIPTIONS</b>                                                |                                                   |
| Roll 2, #20 looking east from Government Dam Rd + 4th North                               |                                                   |

## AGRICULTURAL PRACTICES

Describe how the ground is prepared for planting (e.g., machinery used):

cultivator, fertilize w/ triple shooter, grain drills for planting

What time(s) of year is the soil prepared for planting:

about April 15 → June 1 (depends on year)

How many man-hours are spent preparing soil:

80 hrs/year

How deep is the soil tilled:

10 inches

## FERTILIZERS/PESTICIDES/HERBICIDES

List the fertilizers, pesticides, and herbicides used on the property:

| Type or Trade Name | Quantity Applied per Year | Number of Man-Hours/ Application | Application Method      |
|--------------------|---------------------------|----------------------------------|-------------------------|
| fertilizer         | see below                 | 10 hrs                           | triple shooter          |
| 2-40 type prod.    | 2 gal                     | 3-5 hrs                          | spray truck - herbicide |
|                    |                           |                                  |                         |
|                    |                           |                                  |                         |
|                    |                           |                                  |                         |
|                    |                           |                                  |                         |

60-70 units of Anhydrous ammonia

18 units of 10-34 (10% ammonium nitrogen + 34% phosphate

14 units of ammonium sulfate

units - similar to lbs

## CROP PRODUCTION

| Type of Crop                           | bushel/<br>acre<br>Quantity | Number of<br>Acres Used | Growing<br>Season | Irrigation<br>Used? | Where is<br>Produce<br>Sold or Sent? |
|----------------------------------------|-----------------------------|-------------------------|-------------------|---------------------|--------------------------------------|
| barley (feed or malt)                  | 40                          | 140                     | May 15 - Sept 15  | dry                 | Ozburn Farms                         |
| wheat *                                | 40                          |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
| Water Sources, If Irrigated:           |                             |                         |                   |                     |                                      |
| NA                                     |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
| Describe crop rotation schedule:       |                             |                         |                   |                     |                                      |
| Summer fallow might be eliminated soon |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |
|                                        |                             |                         |                   |                     |                                      |

or

+ then around the country  
(they have their own elevator)

\* barley or wheat - depends on the prices that year

## LIVESTOCK

| Type of Livestock                                                                            | Quantity | Ages | Number of Acres Used | Types of Feed Used | Feed Sources | Water Sources |
|----------------------------------------------------------------------------------------------|----------|------|----------------------|--------------------|--------------|---------------|
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe where livestock are sold or shipped, and for what purpose:                          |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Movement</b>                                                                    |          |      |                      |                    |              |               |
| Are livestock moved to other properties throughout the year, if so describe other locations: |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| How long are each type of livestock kept at this location:                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| What seasons of the year at this location:                                                   |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| <b>Livestock Products</b>                                                                    |          |      |                      |                    |              |               |
| Describe commercial products (e.g., meat, wool, other) produced by livestock:                |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
| Describe livestock products (e.g., eggs, meat, dairy) used by property residents:            |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |
|                                                                                              |          |      |                      |                    |              |               |



APPENDIX N  
DATA QUALITY REPORTS

APPENDIX N-1  
DATA VALIDATION SUMMARY REPORT  
FOR THE  
PHASE I REMEDIAL INVESTIGATION/FEASIBILITY STUDY  
AT THE  
MONSANTO CHEMICAL COMPANY  
SODA SPRINGS ELEMENTAL PHOSPHORUS PLANT  
SODA SPRINGS, IDAHO

April 18, 1992

913-1101.211

TABLE OF CONTENTS

|                                                         | <u>Page No</u> |
|---------------------------------------------------------|----------------|
| 1. INTRODUCTION .....                                   | 1              |
| 2. WATER SAMPLE DATA QUALITY SUMMARY .....              | 1              |
| 2.1 Chemical Data Summary .....                         | 1              |
| 2.1.1 Holding Times .....                               | 1              |
| 2.1.2 Verification of Results .....                     | 1              |
| 2.1.3 Calibrations .....                                | 2              |
| 2.1.4 Blanks .....                                      | 2              |
| 2.1.5 Precision .....                                   | 3              |
| 2.1.5.1 Laboratory Duplicates .....                     | 3              |
| 2.1.5.2 Field Duplicate and Split Samples .....         | 4              |
| 2.1.6 Accuracy .....                                    | 4              |
| 2.2 Radiochemical Data Summary .....                    | 5              |
| 2.2.1 Validation Criteria .....                         | 5              |
| 2.2.2 Holding Times .....                               | 5              |
| 2.2.3 Verification of Results .....                     | 5              |
| 2.2.4 Calibrations .....                                | 5              |
| 2.2.5 Blanks .....                                      | 6              |
| 2.2.6 Precision .....                                   | 6              |
| 2.2.6.1 Laboratory Duplicates .....                     | 6              |
| 2.2.6.2 Field Duplicate and Split Samples .....         | 6              |
| 2.2.7 Accuracy .....                                    | 6              |
| 3. SEDIMENT, SOIL AND SOURCE DATA QUALITY SUMMARY ..... | 7              |
| 3.1 Chemical Data Summary .....                         | 7              |
| 3.1.1 Holding Times .....                               | 7              |
| 3.1.2 Verification of Results .....                     | 7              |
| 3.1.3 Calibrations .....                                | 7              |
| 3.1.4 Blanks .....                                      | 7              |
| 3.1.5 Precision .....                                   | 7              |
| 3.1.5.1 Laboratory Duplicates .....                     | 7              |
| 3.1.5.2 Field Duplicate and Split Samples .....         | 8              |
| 3.1.6 Accuracy .....                                    | 8              |
| 3.2 Radiochemical Data Summary .....                    | 8              |
| 3.2.1 Validation Criteria .....                         | 9              |
| 3.2.2 Holding Times .....                               | 9              |
| 3.2.3 Verification of Results .....                     | 9              |
| 3.2.4 Calibrations .....                                | 10             |
| 3.2.5 Blanks .....                                      | 10             |
| 3.2.6 Precision .....                                   | 10             |
| 3.2.6.1 Laboratory Duplicates .....                     | 10             |
| 3.2.6.2 Field Duplicate and Split Samples .....         | 10             |
| 3.2.7 Accuracy .....                                    | 10             |

|                             |    |
|-----------------------------|----|
| 4. OVERALL ASSESSMENT ..... | 11 |
| 5. REFERENCES .....         | 11 |

#### TABLES

|      |                                            |
|------|--------------------------------------------|
| S-1  | Water Sample Field Duplicate Summary       |
| S-2  | Water Sample Field Split Summary           |
| S-3  | Water Sample Field Split Summary, Cont.    |
| S-4  | Water Sample Field Split Summary, Cont.    |
| S-5  | Split Sample Analytical Method Comparison  |
| S-6  | Soil Sample Field Duplicate Summary        |
| S-7  | Soil Sample Field Duplicate Summary, Cont. |
| S-8  | Soil Sample Field Duplicate Summary, Cont. |
| S-9  | Soil Sample Field Duplicate Summary, Cont. |
| S-10 | Soil Sample Field Split Summary            |

#### ATTACHMENTS

- 1 - Chemical Data Assessment Summary, Water Matrix
- 2 - Radiochemical Data Assessment Summary, Water Matrix
- 3 - Chemical Data Assessment Summary, Soil Matrix
- 4 - Radiochemical Data Assessment Summary, Soil Matrix
- 5 - Split Sample Chemical and Radiochemical Data Assessment Summary

## 1. INTRODUCTION

This report presents a summary of data validation conducted in support of the Phase I Remedial Investigation/Feasibility Study conducted at the Monsanto Chemical Company, Soda Springs, Idaho, Elemental Phosphorus Plant.

Analytical data for radiochemistry, metals and general chemistry analyses were reviewed and validated against the criteria contained in the EPA functional guidelines (Bleyler 1988). Data validation, in general, consisted of a review of laboratory report completeness, holding times, calibrations, duplicates, spikes, controls and blanks. Deficiencies identified during validation resulted in qualifying data as either estimated (J for detected results, UJ for undetected results) or undetected (U).

Samples of water, sediments, surface soil and source material were analyzed for the target compounds listed in the work plan (Golder 1991) by Chen-Northern Inc. (CNI), Billings, Montana (metals and general chemistry analyses) and Acculabs Research Inc. (ALR), Golden, Colorado (radiochemistry analyses). Samples were collected between October 15, 1991 through November 4, 1991.

Section 2 provides a discussion of the water quality data validation and Section 3 discusses the source, sediment and surface soil data validation. Attachments 1 through 5 provide copies of the data assessment summary forms and laboratory results.

## 2. WATER SAMPLE DATA QUALITY SUMMARY

This section provides a summary of the data validation conducted on the water quality data for chemical and radiochemical analyses. Section 2.1 discusses the chemistry data and section 2.2 discusses the radiochemistry data.

### 2.1 Chemical Data Summary

#### 2.1.1 Holding Times

Holding times for metals analyses were 6 months from the date of sample collection. All holding times for metals met this criteria and no data qualification was required. Holding times for the remaining general chemistry parameters were met with the exception of ammonium, chloride, alkalinity (bicarbonate, carbonate, hydroxide), total dissolved solids (TDS), specific conductance, and chemical oxygen demand, however, no gross exceedances (>2x criteria) were observed. Results for these parameters have been qualified as estimated (J for detected results, UJ for undetected results) in associated samples.

#### 2.1.2 Verification of Results

Reported results for all analytes were checked against the raw data to verify the absence of calculation and transcription errors. A few minor transcription errors were detected and the

results were manually corrected on the report forms.

Target sample quantitation limits (TQLs) were specified in Table 7-1 of the work plan (Golder, 1991) and these limits were met by the laboratory with the exception of the quantitation limits for vanadium and silver. Silver and vanadium could not be determined by the laboratory at the work plan TQL values (0.2 µg/L and 5 µg/L) due to the following reasons:

- Precision of silver measurements at the laboratory method detection limit, (MDL of 10 µg/L), was 15 percent relative standard deviation (%RSD). When the laboratory attempted a lower detection limit (<10 µg/L), the %RSD increased to 100%; and
- Precision of vanadium measurements at the laboratory MDL, (10 µg/L) was 6 %RSD and at lower concentrations (8 µg/L or less), the %RSD was greater than 20%.

### 2.1.3 Calibrations

Daily initial calibrations were performed for all analyses. In addition, initial and continuing calibration verifications were analyzed at least every 10 or 20 sample analyses. Minor quality control deficiencies were identified in the calibration verifications for aluminum, arsenic, beryllium, magnesium, nickel and potassium. Sample results associated with these calibration results were either undetected or determined to be undetected based on a review of blanks and were not qualified based on calibration verification criteria.

### 2.1.4 Blanks

Laboratory preparation blanks were analyzed with each sample analysis batch. No target analytes were detected in the preparation blanks at greater than 5 times the target quantitation limits listed in the analytical methods. The following table provides a list of analytes detected in the laboratory blanks and their highest concentrations:

| ANALYTE  | HIGHEST<br>DETECTED<br>CONCENTRATION, mg/L | 5X HIGHEST<br>DETECTED<br>CONCENTRATION, mg/L |
|----------|--------------------------------------------|-----------------------------------------------|
| Sodium   | 0.06                                       | 0.3                                           |
| Aluminum | 0.1                                        | 0.5                                           |
| Lead     | 0.002                                      | 0.01                                          |
| Vanadium | 0.01                                       | 0.05                                          |

Associated sample results (on a sample delivery group basis) that are less than 5 times the sample blank values have been qualified as undetected (U).

Following a review of laboratory blanks, field blank data were reviewed for detected analytes. The following provides a list of analytes detected in the field blanks and their highest

respective concentrations:

| ANALYTE                        | HIGHEST CONCENTRATION<br>DETECTED<br>mg/L except where noted | 5X HIGHEST<br>CONCENTRATION<br>DETECTED |
|--------------------------------|--------------------------------------------------------------|-----------------------------------------|
| Aluminum                       | 0.17                                                         | 0.85                                    |
| Calcium                        | 0.7                                                          | 0.35                                    |
| Copper                         | 0.01                                                         | 0.05                                    |
| Iron                           | 0.168                                                        | 0.84                                    |
| Lead                           | 0.004                                                        | 0.02                                    |
| Managanese                     | 0.011                                                        | 0.055                                   |
| Silver                         | 0.03                                                         | 0.15                                    |
| Sodium                         | 0.27                                                         | 1.35                                    |
| Vanadium                       | 0.04                                                         | 0.2                                     |
| Zinc                           | 0.016                                                        | 0.08                                    |
| Ammonium                       | 0.19                                                         | 0.95                                    |
| Bicarbonate                    | 3.62                                                         | 18.2                                    |
| Chloride                       | 0.34                                                         | 1.7                                     |
| Sulfate                        | 1                                                            | 5                                       |
| Total Phosphorus               | 0.14                                                         | 0.7                                     |
| Sp. Conductance, $\mu$ mhos/cm | 24                                                           | 120                                     |
| Total Diss. Solids             | 13                                                           | 65                                      |

All sample data were reviewed against the field blank concentrations listed above. Sample results less than five times the highest field blank concentration were qualified as undetected (U) in accordance with the validation guidelines.

### 2.1.5 Precision

Compliance with precision data quality objectives was determined by a review of laboratory duplicate, field duplicate and field split analyses.

#### 2.1.5.1 Laboratory Duplicates

Laboratory duplicates were analyzed at the proper frequency and results were acceptable with the exception of some of the pH results which were qualified as estimated (J).

Duplicate injections were not conducted for graphite furnace atomic absorption analyses (GFAA) which is contrary to the analytical requirements, however, since laboratory duplicate analyses were acceptable, in the reviewers judgement, this oversight does not affect sample data quality.

### 2.1.5.2 Field Duplicate and Split Samples

One field duplicate was collected (location TW-26) and analyzed for metals, wet chemistry and radionuclides and the results are presented in Table S-1. Precision (as relative percent difference, RPD) for sample results >5 times the sample quantitation limits (SQLs) ranged from 0 to 20 percent which is within the inorganic validation criteria (Bleyler, 1988).

Three field split samples were collected (locations TW-21, TW-18 and DOC) and analyzed at both Chen-Northern Inc. (CNI)/Acculabs Research (ALR) and Core Laboratories Inc. (Core) of Casper, Wyoming for metals, wet chemistry and radionuclides. Results are presented in Tables S-2 through S-4.

The laboratories were instructed to use identical EPA-reference methods for analyses, however, Core Laboratories used other acceptable EPA-reference methods for analysis of metals and wet chemistry parameters, hence, the split results are not directly comparable. Table S-5 presents a comparison of the analytical methods used by the CNI/ALR and Core.

The most notable differences between results were observed when comparing low concentration (<5x SQL) metals results reported from more sensitive GFAA or inductively coupled plasma (ICP) emission techniques (used by CNI) as opposed to results reported from less sensitive flame atomic absorption (FLAA) techniques (used by Core). These differences would be expected, and, in the reviewers judgement, are not an indication of poor data quality. Where results are observed at higher concentrations (>5x SQL) comparability is better, ranging from 0% to 50% RPD, which exceeds the inorganic validation criteria of 20%. However, since identical analytical procedures were not followed between the two laboratories, this difference should not be considered significant.

No sample data were qualified based on field duplicate and split sample performance.

### 2.1.6 Accuracy

Compliance with accuracy data quality objectives was determined by review of laboratory spike sample and control sample recoveries.

Laboratory matrix spikes were analyzed with each sample delivery group and the results were within the laboratory established control limits with the exception of chromium and iron in sample delivery group three and chromium in sample delivery group one. Results were reported with an "N" qualifier as required by the analytical statement of work, however, no data was qualified during validation since all spike recoveries were within the validation criteria of 75% to 125%.

Analytical spikes were not conducted by the laboratory for GFAA analyses which is contrary to the analytical statement of work requirements, however, this does not affect data quality since spike sample recoveries were acceptable.

At least one laboratory control sample analysis was conducted for each of the four sample delivery groups. All aqueous control sample percent recoveries were within the reference limits of 80 to 120%.

## 2.2 Radiochemical Data Summary

This section presents a summary of the data quality for radiochemical analytes in the water samples.

### 2.2.1 Validation Criteria

The validation criteria used for review of the radiochemical analyses in general followed the recommendations contained in the inorganic data validation functional guidelines (Bleyler, 1988). Information concerning the specifics of the data validation criteria is contained in each of the subsequent sections 2.2.2 through 2.2.6.

### 2.2.2 Holding Times

Holding times specified for the radiochemical analytes were 6 months from date of collection. All analyses were completed within this time frame.

### 2.2.3 Verification of Results

Reported results for all analytes were checked against the raw data to verify the absence of calculation and transcription errors. A few minor transcription errors were detected and the results were manually corrected on the report forms.

### 2.2.4 Calibrations

Data packages were reviewed to verify compliance with the following requirements:

- Instruments and detectors were calibrated initially prior to sample analyses;
- Calibration checks appropriate to the method of analysis were conducted;
- Efficiencies were determined for all Lucas cells used for radium-226 analyses; and
- Calibration sources used for initial and continuing calibration were traceable to NIST or an appropriate standards manufacturer.

All analyses were determined to meet the above criteria and no data qualification was necessary.

### 2.2.5 Blanks

Method blanks, blank planchets, blank Lucas Cells (Radium-226 analyses) and instrument backgrounds were analyzed or determined prior to sample analysis. Several of the method blanks reported contained low concentrations for gross alpha radioactivity, radium-226, radium-228 and radon-222. Sample results less than or equal to five times the associated method blank results were qualified as undetected (U).

### 2.2.6 Precision

Compliance with precision data quality objectives was monitored by a review of laboratory duplicate, field duplicate and field split analyses.

#### 2.2.6.1 Laboratory Duplicates

Laboratory duplicate analyses were reviewed to determine if RPD values were  $\leq 20\%$ . All laboratory duplicate analyses were acceptable.

#### 2.2.6.2 Field Duplicate and Split Samples

Table S-1 presents the results of the single field duplicate sample collected for radionuclides. RPD values ranged from 2 to 200 percent which is within the criteria specified in validation guidelines recommended in Bleyler (1988) with the exception of precision for gross alpha (67%).

Tables S-2 through S-4 present results for split samples for radionuclides. Results between the two laboratories (ALR and Core) vary considerably, however, upon review, these differences are due to different sample quantitation limits reported by the respective laboratories.

No sample data were qualified based on field duplicate and split sample performance.

### 2.2.7 Accuracy

Compliance with accuracy objectives was determined by a review of laboratory control sample (LCS) performance. All radiochemical determinations contained at least one analysis of a traceable LCS and percent recoveries were within the acceptance limits of 80% to 120%.

### 3. SEDIMENT, SOIL AND SOURCE DATA QUALITY SUMMARY

This section presents a summary of the data validation conducted for the sediment, soil and source data. Section 3.1 presents the summary of the chemical data quality and Section 3.2 presents the summary of the radiochemical data quality.

#### 3.1 Chemical Data Summary

##### 3.1.1 Holding Times

All sample analyses met the holding time criteria of 6 months for metals analyses and 28 days for nitrate+nitrite analyses.

##### 3.1.2 Verification of Results

Reported results were verified against the raw data and where minor discrepancies were found the results were corrected on the report forms.

##### 3.1.3 Calibrations

Daily calibrations were conducted for all analyses as were calibration verification checks at least every 10 or 20 analyses. Calibration verification results were exceeded for arsenic and chromium and associated sample results were qualified as estimated (J for detected results, UJ for undetected results).

##### 3.1.4 Blanks

Laboratory method blanks were analyzed with each sample batch. No contaminants were identified in the method blanks of sufficient concentration to warrant qualification of sample results.

Section 2.1.4 provides a summary of the analytes detected in the field blanks. These concentrations were compared to the aqueous-based analyte concentrations contained in the raw data (prior to correction for dilution, solids and moisture content) and no field blank contaminants were present in sufficient concentration to warrant qualification of sample results.

##### 3.1.5 Precision

###### 3.1.5.1 Laboratory Duplicates

Duplicate samples were prepared and analyzed with each sample analysis batch. RPD values for iron, potassium and zinc were outside the acceptance limits and associated sample results have been qualified as estimated (J for detected results, UJ for undetected results).

### 3.1.5.2 Field Duplicate and Split Samples

A total of four field duplicate and one field split samples were collected and analyzed for the target analytes. Tables S-6 through S-10 present a summary of the results. RPD values in field duplicates for nitrate+nitrite as N, (sample S-8B); lead and fluoride, (sample Back-3B); arsenic, chromium, copper and vanadium (sample Soda N) exceeded the validation criteria of 35% RPD, however, this is likely due to heterogeneity of the sample matrix since associated laboratory QC were acceptable for these parameters.

RPD values in the field split sample for aluminum, copper, iron, nickel, potassium, silver, sodium, fluoride and nitrate+nitrite as N also exceeded the 35% RPD criteria however the methods of analysis between the two laboratories were different (see Table S-5), hence, differences would be expected.

### 3.1.6 Accuracy

Spike samples and laboratory control samples were analyzed with each sample batch for metals. Arsenic, cadmium, chromium, selenium and silver spike recoveries exceeded the acceptance limits requiring qualification of associated results as estimated (J for detected results, UJ for undetected results).

Laboratory control sample recoveries were exceeded for potassium and aluminum and associated results have been qualified as estimated (J for detected results) where applicable.

## 3.2 Radiochemical Data Summary

Radiochemical analyses were conducted on sediment, soil and source samples for polonium-210, thorium-228, thorium-230 and thorium-232 using traditional chemical separation and counting methods. In addition, the radionuclides, lead-210, uranium, radium-226, radium-228 and potassium-40 were analyzed using gamma spectrometry procedures by determining the abundance of their respective daughter radionuclides. This was conducted in order to complete the analyses within schedule. The following table provides an explanation of how the results were determined using gamma spectrometry techniques.

| TARGET RADIONUCLIDE | DAUGHTER<br>RADIONUCLIDE and<br>GAMMA ENERGY                                                                                                                                                           | EXPLANATION                                                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead-210            | Lead-210 at 46 KeV                                                                                                                                                                                     | Reported as is                                                                                                                                                                               |
| Uranium             | Thorium-234 @ 63.3 KeV<br>Uranium-235 @ 143 KeV                                                                                                                                                        | Major daughter of uranium-238                                                                                                                                                                |
| Radium-226          | Radium 226 @ 186.0 KeV<br>Lead-214 @ 295.2 KeV<br>Lead-214 @ 352 KeV<br>Bismuth-214 @ 609.4 KeV<br>Bismuth-214 @ 1120.4 KeV<br>Bismuth-214 @ 1764.7 KeV<br>Lead-212 @ 238 KeV<br>Bismuth-212 @ 727 KeV | All are daughter products of Radium-226, however, lead-214 and bismuth-214 daughters are of greatest abundance. Radium-226 reported as the average of the lead-214 and bismuth-214 daughters |
| Radium-228          | Actinium-228 @ 338 KeV<br>Actinium-228 @ 911 KeV<br>Actinium-228 @ 968 KeV                                                                                                                             | All are daughter products of Radium-228, however actinium-228 @ 911 KeV is of greatest abundance. Radium-228 reported as the value of actinium-228 @ 911 KeV.                                |

### 3.2.1 Validation Criteria

The validation criteria used for evaluation of the radiochemical analyses are described in Section 2.2.1.

### 3.2.2 Holding Times

All samples met the holding time criteria of 6 months from date of collection to analysis completion.

### 3.2.3 Verification of Results

Minor transcription errors were identified during verification of reported results against the raw data and these were corrected on the laboratory reports.

### 3.2.4 Calibrations

Review of calibration data for all analyses revealed that the following requirements were met:

- Instruments and detectors were calibrated initially prior to sample analyses;
- Daily calibration checks were performed for the radiochemical separation and counting methods (polonium, thorium, lead) and a gamma energy calibration for all target energies of interest was conducted;
- Detector efficiencies were reported and verified in the raw data; and
- Calibration sources used for calibrations were identified and traceable to NIST or an appropriate standards manufacturer.

### 3.2.5 Blanks

Method blanks, blank planchets and instrument backgrounds were analyzed or determined prior to sample analysis. No blank contamination was identified which required qualification of sample results.

### 3.2.6 Precision

#### 3.2.6.1 Laboratory Duplicates

Duplicate analyses were conducted for each sample delivery group and RPD results were within the laboratory control limits.

#### 3.2.6.2 Field Duplicate and Split Samples

A total of four field duplicate samples were collected and analyzed for the target radionuclides of concern. Tables S-6 through S-10 present a summary of the results. RPD values for field duplicates ranged from 0 to 100 percent which is within the validation criteria of plus or minus two times the method detection limits. RPD values for field splits were acceptable with the exception of the radium-228 values (109%) which is likely due to slight differences in instrument backgrounds and sample preparation methods.

### 3.2.7 Accuracy

Accuracy of the radionuclide analyses was monitored by the laboratory by the analysis of traceable LCSs. LCS analyses were performed daily or with each sample batch and all percent recoveries were within the acceptance limits of 80% to 120%.

#### 4. OVERALL ASSESSMENT

Analytical data from the chemical and radiochemical analysis of 109 water samples and 78 source, sediment and soil samples were validated in order to verify that reported results were of sufficient quality to support the project work plan objectives. The samples were analyzed for metals, general chemical parameters and radionuclides.

Validation was conducted using U.S. EPA CLP guidelines (Bleyler, 1988). No data were rejected based on the validation conducted. Some minor quality control deficiencies were identified which resulted in qualification of data as undetected (U) or estimated (J or UJ) and these deficiencies are summarized in the preceeding sections. Two notable deficiencies were identified during validation and are summarized below.

- Silver and vanadium results in the water samples were not reported to the target quantitation limits due to the low precision of the analytical measurement equipment at the target limits of 0.2 µg/L and 5 µg/L, respectively, and
- Field split results for water and soil samples showed significant differences for the metals, general chemistry and radionuclide parameters however, these are likely due to the use of different analytical methods and method detection limits by the respective laboratories.

With the exception of the minor deficiencies summarized previously, the work plan quality assurance objectives were met and, the analytical data, as qualified, are acceptable for use.

#### 5. REFERENCES

Bleyler, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis, U.S. Environmental Protection Agency, Washington, D.C.

Golder 1991, Phase I Remedial Investigation/Feasibility Study Work Plan for the Soda Springs Elemental Phosphorus Plant, Golder Associates Inc., Redmond, Washington.

APPENDIX S

TABLES

TABLE S-1. WATER SAMPLE FIELD DUPLICATE SUMMARY

| ANALYTE                                    | TW-26  | TW-26-DUP | RPD |
|--------------------------------------------|--------|-----------|-----|
| Aluminum                                   | 0.1    | 0.12      | 18  |
| Arsenic                                    | <0.002 | 0.002     | 200 |
| Beryllium                                  | <0.001 | <0.001    | NC  |
| Cadmium                                    | <0.005 | <0.005    | NC  |
| Calcium                                    | 120    | 123       | 2   |
| Chromium                                   | <0.01  | <0.01     | NC  |
| Copper                                     | 0.005  | <0.005    | 200 |
| Iron                                       | 0.22   | 0.27      | 20  |
| Lead                                       | 0.001  | 0.002     | 67  |
| Magnesium                                  | 124    | 126       | 2   |
| Manganese                                  | 0.72   | 0.74      | 3   |
| Nickel                                     | <0.02  | <0.02     | NC  |
| Potassium                                  | 25.5   | 25        | 2   |
| Selenium                                   | 0.007  | 0.007     | 0   |
| Silver                                     | <0.01  | <0.01     | NC  |
| Sodium                                     | 108    | 112       | 4   |
| Vanadium                                   | 0.01   | <0.01     | 200 |
| Zinc                                       | 0.032  | 0.028     | 13  |
| Ammonium                                   | 1.8    | 1.7       | 6   |
| Bicarbonate                                | 560    | 554       | 1   |
| Carbonate                                  | 0      | 0         | NC  |
| Chloride                                   | 104    | 101       | 3   |
| Fluoride                                   | 1.02   | 1.12      | 9   |
| Hydroxide                                  | 0      | 0         | NC  |
| Nitrate+nitrite-N                          | 7.95   | 7.9       | 1   |
| Sulfate                                    | 360    | 360       | 0   |
| Total Phosphorus                           | 0.67   | 0.7       | 4   |
| pH, std. units                             | 6.7    | 6.7       | 0   |
| Specific Conductance, $\mu$ mhos/Cm @ 25°C | 1730   | 1820      | 5   |
| Total Dissolved Solids @ 180°C             | 1180   | 1180      | 0   |
| Gross Alpha, total, pCi/L                  | 6      | 12        | 67  |
| Radium-226, total, pCi/L                   | 0.4    | <0.5      | 200 |
| Radium-228, total, pCi/L                   | <-0.1  | <0.1      | NC  |
| Radon-222, total, pCi/L                    | 94     | 92        | 2   |
| Uranium, total, mg/L                       | <0.002 | <0.002    | NC  |

Results are reported in mg/L except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-2. WATER SAMPLE FIELD SPLIT SUMMARY

| ANALYTE                                    | TW-21  | TW-21-S | RPD |
|--------------------------------------------|--------|---------|-----|
| Aluminum                                   | 0.18   | <1      | 200 |
| Arsenic                                    | <0.002 | <0.002  | NC  |
| Beryllium                                  | <0.001 | <0.01   | NC  |
| Cadmium                                    | <0.005 | 0.02    | 200 |
| Calcium                                    | 60     | 60      | 0   |
| Chromium                                   | <0.01  | 0.07    | 200 |
| Copper                                     | <0.005 | 0.01    | 200 |
| Iron                                       | 7.72   | 8.41    | 9   |
| Lead                                       | 0.001  | 0.09    | 196 |
| Magnesium                                  | 264    | 265     | 0   |
| Manganese                                  | 0.17   | 0.22    | 26  |
| Nickel                                     | 0.03   | 0.14    | 129 |
| Potassium                                  | 20.3   | 17.2    | 17  |
| Selenium                                   | <0.003 | <0.001  | NC  |
| Silver                                     | <0.01  | 0.09    | 200 |
| Sodium                                     | 44     | 40      | 10  |
| Vanadium                                   | <0.01  | 0.24    | 200 |
| Zinc                                       | <0.008 | <0.1    | NC  |
| Ammonium                                   | 0.36   | 0.2     | 57  |
| Bicarbonate                                | 1416   | 732     | 64  |
| Carbonate                                  | 0      | 264     | 200 |
| Chloride                                   | 21     | 19      | 10  |
| Fluoride                                   | 0.2    | 0.2     | 0   |
| Hydroxide                                  | 0      | <1      | NC  |
| Nitrate+nitrite-N                          | 0.5    | <0.1    | 200 |
| Sulfate                                    | 84     | 94      | 11  |
| Total Phosphorus                           | 0.79   | 0.75    | 5   |
| pH, std. units                             | 6.1    | 9.35    | 42  |
| Specific Conductance, $\mu$ mhos/Cm @ 25°C | 1920   | 1470    | 27  |
| Total Dissolved Solids @ 180°C             | 1120   | 1280    | 13  |
| Gross Alpha, total, pCi/L                  | <1     | <33     | NC  |
| Radium-226, total, pCi/L                   | <-0.3  | <0.2    | NC  |
| Radium-228, total, pCi/L                   | <0.1   | <2.6    | NC  |
| Radon-222, total, pCi/L                    | 120    | 222     | 60  |
| Uranium, total, mg/L                       | <0.002 | 0.01    | 200 |

Results are reported in mg/L except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-3. WATER SAMPLE FIELD SPLIT SUMMARY, CONT.

| ANALYTE                                                 | TW-18  | TW-18-S | RPD |
|---------------------------------------------------------|--------|---------|-----|
| Aluminum                                                | 0.06   | <1      | 200 |
| Arsenic                                                 | 0.003  | 0.003   | 0   |
| Beryllium                                               | <0.001 | <0.01   | NC  |
| Cadmium                                                 | <0.005 | 0.01    | 200 |
| Calcium                                                 | 88.5   | 97      | 9   |
| Chromium                                                | <0.01  | 0.07    | 200 |
| Copper                                                  | <0.005 | 0.01    | 200 |
| Iron                                                    | 6.74   | 8.27    | 20  |
| Lead                                                    | <0.001 | 0.12    | 200 |
| Magnesium                                               | 190    | 218     | 14  |
| Manganese                                               | 0.29   | 0.36    | 22  |
| Nickel                                                  | <0.02  | 0.07    | 200 |
| Potassium                                               | 21.9   | 16      | 31  |
| Selenium                                                | <0.003 | <0.001  | NC  |
| Silver                                                  | <0.01  | 0.05    | 200 |
| Sodium                                                  | 42.8   | 40      | 7   |
| Vanadium                                                | <0.01  | 0.24    | 200 |
| Zinc                                                    | 0.01   | <0.1    | 200 |
| Ammonium                                                | 0.35   | 0.2     | 55  |
| Bicarbonate                                             | 1340   | 1330    | 1   |
| Carbonate                                               | 0      | <1      | NC  |
| Chloride                                                | 17     | 14      | 19  |
| Fluoride                                                | 0.23   | 0.2     | 14  |
| Hydroxide                                               | 0      | <1      | NC  |
| Nitrate+nitrite-N                                       | <0.5   | <0.1    | NC  |
| Sulfate                                                 | 60     | 53      | 12  |
| Total Phosphorus                                        | 0.35   | 0.59    | 51  |
| pH, std. units                                          | 6      | 7.8     | 26  |
| Specific Conductance, $\mu\text{mhos}/\text{Cm}$ @ 25°C | 2000   | 1780    | 12  |
| Total Dissolved Solids @ 180°C                          | 1004   | 1180    | 16  |
| Gross Alpha, total, pCi/L                               | -7     | 20.2    | 412 |
| Radium-226, total, pCi/L                                | <0.2   | 0.1     | 200 |
| Radium-228, total, pCi/L                                | <-0.1  | <8.3    | NC  |
| Radon-222, total, pCi/L                                 | 93     | 292     | 103 |
| Uranium, total, mg/L                                    | <0.002 | 0.004   | 200 |

Results are reported in mg/L except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-4. WATER SAMPLE FIELD SPLIT SUMMARY, CONT.

| ANALYTE                                    | DOC    | DOC-S  | RPD |
|--------------------------------------------|--------|--------|-----|
| Aluminum                                   | 0.08   | 0.2    | 86  |
| Arsenic                                    | <0.002 | <0.002 | NC  |
| Beryllium                                  | <0.001 | <0.01  | NC  |
| Cadmium                                    | <0.005 | 0.01   | 200 |
| Calcium                                    | 116    | 120    | 3   |
| Chromium                                   | <0.01  | 0.07   | 200 |
| Copper                                     | <0.005 | <0.01  | NC  |
| Iron                                       | 8.34   | 8.38   | 0   |
| Lead                                       | <0.001 | 0.07   | 200 |
| Magnesium                                  | 133    | 138    | 4   |
| Manganese                                  | 0.298  | 0.33   | 10  |
| Nickel                                     | <0.02  | 0.08   | 200 |
| Potassium                                  | 14.1   | 11.2   | 23  |
| Selenium                                   | <0.002 | <0.001 | NC  |
| Silver                                     | <0.01  | <0.05  | NC  |
| Sodium                                     | 34.2   | 30     | 13  |
| Vanadium                                   | 0.02   | 0.25   | 170 |
| Zinc                                       | 0.009  | <0.1   | 200 |
| Ammonium                                   | 0.6    | 0.4    | 40  |
| Bicarbonate                                | 496    | 1000   | 67  |
| Carbonate                                  | 0      | <1     | NC  |
| Chloride                                   | 14     | 11     | 24  |
| Fluoride                                   | 0.38   | 0.4    | 5   |
| Hydroxide                                  | 0      | <1     | NC  |
| Nitrate+nitrite-N                          | <0.5   | <0.1   | NC  |
| Sulfate                                    | 30     | 55     | 59  |
| Total Phosphorus                           | 0.37   | 0.33   | 11  |
| pH, std. units                             | 6      | 7.3    | 20  |
| Specific Conductance, $\mu$ mhos/Cm @ 25°C | 1510   | 1430   | 5   |
| Total Dissolved Solids @ 180°C             | 812    | 910    | 11  |
| Gross Alpha, total, pCi/L                  | 0      | 4.1    | 200 |
| Radium-226, total, pCi/L                   | <-0.1  | 0.3    | 200 |
| Radium-228, total, pCi/L                   | <0.3   | <8.3   | NC  |
| Radon-222, total, pCi/L                    | 62     | 205    | 107 |
| Uranium, total, mg/L                       | <0.002 | 0.004  | 200 |

Results are reported in mg/L except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-5. SPLIT SAMPLE ANALYTICAL METHOD COMPARISON

| ANALYTE   | METHOD OF ANALYSIS |      |           |      | ANALYTE                | METHOD OF ANALYSIS |      |                 |      |
|-----------|--------------------|------|-----------|------|------------------------|--------------------|------|-----------------|------|
|           | CN/ALR             |      | CORE      |      |                        | CN/ALR             |      | CORE            |      |
| Aluminum  | 6010 (1)           | ICP  | 7020 (1)  | FLAA | Zinc                   | 6010 (1)           | ICP  | 7950 (1)        | FLAA |
| Arsenic   | 7061 (1)           | H    | 7061 (1)  | H    | Ammonium               | 350.1 (2)          | AP   | 350.3 (2)       | ISE  |
| Beryllium | 7091 (1)           | GFAA | 7090 (1)  | FLAA | Bicarbonate            | 310.1 (2)          | T    | 310.1 (2)       | T    |
| Cadmium   | 7131 (1)           | GFAA | 7130 (1)  | FLAA | Carbonate              | 310.1 (2)          | T    | 310.1 (2)       | T    |
| Calcium   | 6010 (1)           | ICP  | 215.1 (2) | FLAA | Chloride               | 325.3 (2)          | T    | 325.1 (2)       | AF   |
| Chromium  | 6010 (1)           | ICP  | 7190 (1)  | FLAA | Fluoride               | 340.2 (2)          | ISE  | 340.2 (2)       | ISE  |
| Copper    | 7211 (1)           | GFAA | 7210 (1)  | FLAA | Hydroxide              | 310.1 (2)          | T    | 310.1 (2)       | T    |
| Iron      | 6010 (1)           | ICP  | 7380 (1)  | FLAA | Nitrate+nitrite-N      | 353.2 (2)          | ACR  | 352.1+354.1 (2) | BM   |
| Lead      | 7421 (1)           | GFAA | 7420 (1)  | FLAA | Sulfate                | 375.2 (2)          | AM   | 375.2 (2)       | AM   |
| Magnesium | 6010 (1)           | ICP  | 242.1 (2) | FLAA | Total Phosphorus       | 365.2 (2)          | MA   | 365.2 (2)       | MA   |
| Manganese | 6010 (1)           | ICP  | 7460 (1)  | FLAA | pH, std. units         | 150.1 (2)          | E    | 150.1 (2)       | E    |
| Nickel    | 219.2 (2)          | GFAA | 7520 (1)  | FLAA | Specific Conductance   | 120.1 (2)          | E    | 120.1 (2)       | E    |
| Potassium | 258.1 (2)          | FLAA | 258.1 (2) | FLAA | Total Dissolved Solids | 160.1 (2)          | G    | 160.1 (2)       | G    |
| Selenium  | 7741 (1)           | H    | 7741 (1)  | H    | Gross Alpha            | 900.0 (3)          | GFPC | 900.0 (3)       | GFPC |
| Silver    | 7761 (1)           | GFAA | 7760 (1)  | FLAA | Radium-226             | 903.1 (3)          | REAS | 903.1 (3)       | REAS |
| Sodium    | 6010 (1)           | ICP  | 273.1 (2) | FLAA | Radium-228             | 904.0 (3)          | LBPC | 904.0 (3)       | LBPC |
| Vanadium  | 7911 (1)           | GFAA | 7910 (1)  | FLAA | Radon-222              | ---                | LS   | ---             | LS   |
|           |                    |      |           |      | Uranium                | 908.1              | F    | 908.1           | F    |

CN/ALR - Chen-Northern, Billings, Montana. Acculabs Research, Golden, Colorado.

CORE - Core Laboratories, Casper, Wyoming.

(1) - Method from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, September 1988".

(2) - Method from "Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983".

(3) - Method from "Prescribed Procedures for the Measurement of Radioactivity in Drinking Water, EPA-600/4-80-075, November 1980".

ICP - Inductively Coupled Plasma Atomic Emission Spectrometry

GFAA - Graphite Furnace Atomic Absorption Spectrophotometry

FLAA - Flame Atomic Absorption Spectrophotometry

H - Gaseous Hydride Flame Atomic Absorption Spectrophotometry

AP - Automated Phenate Colorimetric Method

T - Titrimetric Method

AF - Automated Ferricyanide Colorimetric Method

ISE - Ion Selective Electrode Method

ACR - Automated Cadmium Reduction Colorimetric Method

BM - Brucine Sulfate/Manual Diazotization Colorimetric Method

AM - Automated Methylthymol Blue Colorimetric Method

MA - Manual Ascorbic Acid Colorimetric Method

E - Manual Electrode Method

G - Gravimetric Method

GFPC - Gas Flow Proportional Counting Method

REAS - Radon Emanation Alpha Scintillation Method

LBPC - Low Background Proportional Counter

LS - Liquid Scintillation Method

F - Fluorometric Method

TABLE S-6. SOIL SAMPLE FIELD DUPLICATE SUMMARY

| ANALYTE                            | S-8A  | S-8A-DUP | RPD |
|------------------------------------|-------|----------|-----|
| Aluminum                           | 21900 | 22500    | 3   |
| Arsenic                            | 5.6   | 6.6      | 16  |
| Beryllium                          | 2     | 2        | 0   |
| Cadmium                            | 13    | 14       | 7   |
| Chromium                           | 39    | 42       | 7   |
| Copper                             | 17    | 17       | 0   |
| Iron                               | 17300 | 17700    | 2   |
| Lead                               | 24    | 28       | 15  |
| Manganese                          | 411   | 406      | 1   |
| Nickel                             | 30    | 32       | 6   |
| Potassium                          | 4600  | 5500     | 18  |
| Selenium                           | 1     | 0.8      | 22  |
| Silver                             | 1.5   | 1        | 40  |
| Sodium                             | 424   | 399      | 6   |
| Vanadium                           | 63.3  | 67.4     | 6   |
| Zinc                               | 210   | 215      | 2   |
| Fluoride                           | 33.1  | 33.1     | 0   |
| Cation Exchange Capacity, meq/100g | 17.6  | 18.6     | 6   |
| Nitrate+nitrite-N                  | 6.1   | 5.1      | 18  |
| pH, std. units                     | 7.6   | 7.5      | 1   |
| Polonium-210, total, pCi/g         | 5.7   | 5.7      | 0   |
| Thorium-228, total, pCi/g          | 0.9   | 1.2      | 29  |
| Thorium-230, total, pCi/g          | 3.1   | 2.8      | 10  |
| Thorium-232, total, pCi/g          | 1     | 0.6      | 50  |
| Lead-210, pCi/g                    | 6     | 6.9      | 14  |
| Uranium, pCi/g                     | 4.2   | 4.1      | 2   |
| Radium-226, pCi/g                  | 4     | 3.8      | 5   |
| Radium-228, pCi/g                  | 1.2   | 1.1      | 9   |
| Potassium-40, pCi/g                | 16    | 17       | 6   |

Results are reported in mg/Kg except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-7. SOIL SAMPLE FIELD DUPLICATE SUMMARY, CONT.

| ANALYTE                            | S-8B  | S-8B-DUP | RPD |
|------------------------------------|-------|----------|-----|
| Aluminum                           | 29200 | 31700    | 8   |
| Arsenic                            | 6.7   | 6.4      | 5   |
| Beryllium                          | 2     | 2        | 0   |
| Cadmium                            | 13    | 13.1     | 1   |
| Chromium                           | 57    | 60       | 5   |
| Copper                             | 17    | 17       | 0   |
| Iron                               | 24600 | 24000    | 2   |
| Lead                               | 21    | 18       | 15  |
| Manganese                          | 424   | 424      | 0   |
| Nickel                             | 32    | 37       | 14  |
| Potassium                          | 5400  | 5200     | 4   |
| Selenium                           | 1     | 1        | 0   |
| Silver                             | 1     | 1        | 0   |
| Sodium                             | 349   | 399      | 13  |
| Vanadium                           | 87    | 92       | 6   |
| Zinc                               | 210   | 215      | 2   |
| Fluoride                           | 23    | 25.8     | 11  |
| Cation Exchange Capacity, meq/100g | 17.6  | 23.3     | 28  |
| Nitrate+nitrite-N                  | 9.8   | 19       | 64  |
| pH, std. units                     | 7.6   | 7.4      | 3   |
| Polonium-210, total, pCi/g         | 7     | 5.5      | 24  |
| Thorium-228, total, pCi/g          | 1     | 1        | 0   |
| Thorium-230, total, pCi/g          | 4     | 3.9      | 3   |
| Thorium-232, total, pCi/g          | 1     | 0.9      | 11  |
| Lead-210, pCi/g                    | 6.5   | 6.8      | 5   |
| Uranium, pCi/g                     | 3.1   | 3.2      | 3   |
| Radium-226, pCi/g                  | 3.7   | 3.4      | 8   |
| Radium-228, pCi/g                  | 1.1   | 1.1      | 0   |
| Potassium-40, pCi/g                | 16    | 15       | 6   |

Results are reported in mg/Kg except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-8. SOIL SAMPLE FIELD DUPLICATE SUMMARY, CONT.

| ANALYTE                            | Back-3B | Back-3C | RPD |
|------------------------------------|---------|---------|-----|
| Aluminum                           | 17400   | 16700   | 4   |
| Arsenic                            | 5       | 5       | 0   |
| Beryllium                          | 1       | 2       | 67  |
| Cadmium                            | 7       | 6       | 15  |
| Chromium                           | 15      | 13      | 14  |
| Copper                             | 14      | 15      | 7   |
| Iron                               | 23000   | 21900   | 5   |
| Lead                               | 81      | 25      | 106 |
| Manganese                          | 514     | 493     | 4   |
| Nickel                             | 37      | 37      | 0   |
| Potassium                          | 3800    | 3900    | 3   |
| Selenium                           | <0.6    | <0.6    | NC  |
| Silver                             | <2      | 2       | 200 |
| Sodium                             | 798     | 972     | 20  |
| Vanadium                           | 42      | 40      | 5   |
| Zinc                               | 78.3    | 63.8    | 20  |
| Fluoride                           | 5.7     | 3.9     | 38  |
| Cation Exchange Capacity, meq/100g | 22.3    | 22.5    | 1   |
| Nitrate+nitrite-N                  | 12      | 13      | 8   |
| pH, std. units                     | 7.7     | 7.7     | 0   |
| Polonium-210, total, pCi/g         | 1.4     | 1       | 33  |
| Thorium-228, total, pCi/g          | 0.9     | 0.9     | 0   |
| Thorium-230, total, pCi/g          | 0.9     | 0.8     | 12  |
| Thorium-232, total, pCi/g          | 1       | 1       | 0   |
| Lead-210, pCi/g                    | 1.2     | 1.1     | 9   |
| Uranium, pCi/g                     | 1.2     | 0.8     | 40  |
| Radium-226, pCi/g                  | 1       | 0.9     | 11  |
| Radium-228, pCi/g                  | 1.2     | 1       | 18  |
| Potassium-40, pCi/g                | 15      | 15      | 0   |

Results are reported in mg/Kg except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-9. SOIL SAMPLE FIELD DUPLICATE SUMMARY, CONT.

| ANALYTE                            | Soda N | Soda S | RPD |
|------------------------------------|--------|--------|-----|
| Aluminum                           | 7280   | 8460   | 15  |
| Arsenic                            | 8.2    | 15     | 59  |
| Beryllium                          | 2.7    | 3      | 11  |
| Cadmium                            | 25.1   | 29.6   | 16  |
| Chromium                           | 13     | 19     | 38  |
| Copper                             | 7      | 16     | 78  |
| Iron                               | 194000 | 197000 | 2   |
| Lead                               | 11     | 10     | 10  |
| Manganese                          | 1200   | 1270   | 6   |
| Nickel                             | 82.3   | 89     | 8   |
| Potassium                          | 13500  | 13900  | 3   |
| Selenium                           | 1      | 1.2    | 18  |
| Silver                             | 0.2    | 0.5    | 86  |
| Sodium                             | 600    | 800    | 29  |
| Vanadium                           | 94     | 208    | 75  |
| Zinc                               | 100    | 110    | 10  |
| Fluoride                           | 2.3    | 1.7    | 30  |
| Cation Exchange Capacity, meq/100g | 33.2   | 58.1   | 55  |
| Nitrate+nitrite-N                  | ---    | ---    | --- |
| pH, std. units                     | 7.1    | 7.6    | 7   |
| Polonium-210, total, pCi/g         | 0.5    | 0.6    | 18  |
| Thorium-228, total, pCi/g          | 0.3    | 0.3    | 0   |
| Thorium-230, total, pCi/g          | 1.4    | 0.7    | 67  |
| Thorium-232, total, pCi/g          | 0.3    | 0.1    | 100 |
| Lead-210, pCi/g                    | 0.4    | 0.5    | 22  |
| Uranium, pCi/g                     | 0.6    | 0.6    | 0   |
| Radium-226, pCi/g                  | 0.6    | 0.6    | 0   |
| Radium-228, pCi/g                  | 0.4    | 0.4    | 0   |
| Potassium-40, pCi/g                | 5.4    | 5.3    | 2   |

Results are reported in mg/Kg except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

NC - Indicates the RPD value can not be calculated due to both results being less than the detection limit.

TABLE S-10. SOIL SAMPLE FIELD SPLIT SUMMARY

| ANALYTE                            | S-11b | S-11b-S | RPD |
|------------------------------------|-------|---------|-----|
| Aluminum                           | 27200 | 12600   | 73  |
| Arsenic                            | 5.6   | 4.3     | 26  |
| Beryllium                          | 2     | 0.7     | 96  |
| Cadmium                            | 16    | 19.3    | 19  |
| Chromium                           | 55    | 30.3    | 58  |
| Copper                             | 2     | 17.8    | 160 |
| Iron                               | 20000 | 11800   | 52  |
| Lead                               | 20    | 21.9    | 9   |
| Manganese                          | 417   | 463     | 10  |
| Nickel                             | 35    | 23.6    | 39  |
| Potassium                          | 5400  | 3530    | 42  |
| Selenium                           | 1.2   | 2.8     | 80  |
| Silver                             | 1.5   | 6.7     | 127 |
| Sodium                             | 300   | 680     | 78  |
| Vanadium                           | 87    | 78.5    | 10  |
| Zinc                               | 250   | 209     | 18  |
| Fluoride                           | 24.8  | 6.7     | 115 |
| Cation Exchange Capacity, meq/100g | 19.4  | <10     | 200 |
| Nitrate+nitrite-N                  | 5.6   | <0.1    | 200 |
| pH, std. units                     | 7.0   | 6.75    | 4   |
| Polonium-210, total, pCi/g         | 4.1   | ---     | --- |
| Thorium-228, total, pCi/g          | 1.1   | 1.5     | 31  |
| Thorium-230, total, pCi/g          | 3.4   | 3.7     | 8   |
| Thorium-232, total, pCi/g          | 1.3   | 1.4     | 7   |
| Lead-210, pCi/g                    | 4.5   | 4.4     | 2   |
| Uranium, pCi/g                     | *     | *       | --- |
| Radium-226, pCi/g                  | 3.0   | 3.7     | 21  |
| Radium-228, pCi/g                  | 1.2   | 4.1     | 109 |
| Potassium-40, pCi/g                | 19.0  | 18.5    | 3   |

Results are reported in mg/Kg except where noted.

RPD - Relative percent difference. Equal to the absolute value of the difference between two measurements divided by the average and multiplied by 100. A value of zero is substituted when one result is less than the detection limit.

--- - Indicates analyte not determined.

\* - Results could not be compared since uranium was analyzed by ALR using gamma spectrometry and by Core using fluorimetric procedures.

**APPENDIX S**

**ATTACHMENT 1**

**INORGANIC DATA ASSESSMENT SUMMARIES - WATER SAMPLES**

# INORGANIC DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101-211 SITE Monsanto Soda Spgs  
 LABORATORY Chem-Northville SAMPLES/MATRIX 17  
Waters 121145-121150,  
 SDG # 91-942 (1) 121153-121157, 121162-  
121167

## DATA ASSESSMENT SUMMARY *Wet Chem*

|                         | ICP      | AA                   | <del>ISE</del><br>HG     | CYANIDE |
|-------------------------|----------|----------------------|--------------------------|---------|
| 1. HOLDING TIMES        | <u>0</u> | <u>0</u>             | <u>0<sup>3</sup></u>     |         |
| 2. CALIBRATIONS         | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 3. BLANKS               | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 4. ICS                  | <u>0</u> |                      |                          |         |
| 5. LCS                  | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 6. DUPLICATE ANALYSIS   | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 7. MATRIX SPIKE         | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 8. MSA                  |          | <u>X<sup>2</sup></u> |                          |         |
| 9. SERIAL DILUTION      | <u>0</u> |                      | <u>X<sup>1</sup></u>     |         |
| 10. SAMPLE VERIFICATION | <u>0</u> | <u>0</u>             | <u>0</u> <i>LA 11/12</i> |         |
| 11. OTHER QC            | <u>0</u> | <u>0</u>             | <u>0</u>                 |         |
| 12. OVERALL ASSESSMENT  | <u>0</u> | <u>0</u>             | <u>X<sup>1</sup></u>     |         |

*4/13/92*

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: Raw data for F, SO<sub>4</sub>, NO<sub>2</sub>, TP not provided, lab contacted.

<sup>2</sup> Analytical spikes not performed as per SDW lab contacted.

<sup>3</sup> Holding times missed for NH<sub>4</sub><sup>+</sup>, Cl, Sp. Cond, TDS results qualified as estimated.

Validated by: T. M. M. M. M. M.

Date: 1/13/92

Reviewed by: Kenny Louie

Date: 4/17/92

SDG # 91-942Project No. 913-1101-211Acceptable  
YES NO

1. Holding Times -----

Holding times missed for compounds shown  
on attached, results qualify for HT

2. Calibrations -----

Proper number of standards used for all analyses  
r values acceptable, RCV, CCV ok.

3. Blanks -----

Method blanks and field blanks analyzed  
ICP, CC analyzed for ICP/AA analyses.

4. ICP Interference Check Sample (ICS) -----

ICS acceptable

5. Laboratory Control Sample (LCS) -----

LCS acceptable

6. Duplicate Sample Analysis -----

Lab duplicate analyses acceptable

7. Matrix Spike Sample Analysis -----

Spike analyses acceptable

SDG # 91-942Project No. 913-1101-211Acceptable  
YES NO

8. Furnace Atomic Absorption QC -----

Analytical spikes not run but matrix  
spikes acceptable and internal lab  
spikes acceptable.

9. ICP Serial Dilution -----

ISO acceptable

10. Sample Result Verification -----

Results verified and corrected as  
appropriate on attached Forms.

11. Field Duplicates -----

2/14

12. Overall Assessment -----

QA/QC spikes need to be run in  
future and rounds. Validation of  
this data will be completed when  
remaining raw data is received.  
IDL's and CRPLs met as specified  
in QAPP with the exception of Silver  
and Manganese. Data sheets  
will show PBO's plus correction  
of CRPL's.

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. Calf Spring

Matrix (Soil/Water): Water

Lab Sample ID: 121145

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION  | C | Q | M            |
|-----------|------------------------|----------------|---|---|--------------|
| 7429-90-5 | Aluminum               | 0.16 ✓         | U |   | P            |
| 7440-38-2 | Arsenic                | 0.002 ✓        | U |   | H            |
| 7440-41-7 | Beryllium              | 0.001 ✓        | U |   | <del>P</del> |
| 7440-43-9 | Cadmium                | 0.006 ✓        |   |   | F            |
| 7440-70-2 | Calcium                | 128 ✓          |   |   | P            |
| 7440-47-3 | Chromium               | 0.01 ✓         | U | ✓ | P            |
| 7440-50-8 | Copper                 | 0.005 ✓        | U |   | F            |
| 7439-89-6 | Iron                   | 0.067 ✓        | U |   | P            |
| 7439-92-1 | Lead                   | 0.001 ✓        | U |   | F            |
| 7439-95-4 | Magnesium              | 69 ✓           |   |   | P            |
| 7439-96-5 | Manganese              | 0.015 ✓        | U |   | P            |
| 7440-02-0 | Nickel                 | 0.02 ✓         | U |   | F            |
| 7440-09-7 | Potassium              | 14.3 ✓         |   |   | A            |
| 7782-49-2 | Selenium               | 0.003 ✓        | U |   | H            |
| 7440-22-4 | Silver                 | (.0002) 0.01 ✓ | U |   | <del>P</del> |
| 7440-23-5 | Sodium                 | 55 ✓           |   |   | P            |
| 7440-62-2 | Vanadium               | 0.01 ✓         | U |   | F            |
| 7440-66-6 | Zinc                   | 0.071 ✓        | U |   | P            |
|           | Ammonium               | 0.10 ✓         | U |   | AP           |
|           | Bicarbonate            | 542 ✓          |   |   | T            |
|           | Carbonate              | 0 ✓            |   |   | T            |
|           | Chloride               | 87 ✓           | J |   | T            |
|           | Fluoride               | 3.0 ✓          |   |   | ISE          |
|           | Hydroxide              | 0 ✓            |   |   | T            |
|           | Nitrate/Nitrite as N   | 2.56 ✓         |   |   | ACR          |
|           | Sulfate                | 126 ✓          |   |   | AM           |
|           | Total Phosphorus       | 0.31 ✓         | U |   | MA           |
|           | pH                     | 6.7 ✓          |   |   | E            |
|           | Specific Conductance   | 1320 ✓         | J |   | E            |
|           | Total Dissolved Solids | 807 ✓          |   |   | G            |
|           | Turbidity              | Not required   |   |   | N            |

F KAS

F KAS

10/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. Mormon B

Matrix (Soil/Water): Water

Lab Sample ID: 121146

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | O            | M                  |
|-----------|------------------------|---------------|---|--------------|--------------------|
| 7429-90-5 | Aluminum               | 0.14 ✓        |   |              | P                  |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |              | H                  |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |              | <del>P</del> F KAB |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |              | P                  |
| 7440-70-2 | Calcium                | 88 ✓          |   |              | P                  |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | <del>N</del> | P                  |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |              | P                  |
| 7439-89-6 | Iron                   | 0.025 ✓       | U |              | P                  |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |              | F                  |
| 7439-95-4 | Magnesium              | 98 ✓          |   |              | P                  |
| 7439-96-5 | Manganese              | 0.005 ✓       |   |              | P                  |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |              | F                  |
| 7440-09-7 | Potassium              | 12.5 ✓        |   |              | A                  |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |              | H                  |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |              | <del>T</del> F KAB |
| 7440-23-5 | Sodium                 | 64 ✓          |   |              | P                  |
| 7440-62-2 | Vanadium               | 0.01 ✓        |   |              | P                  |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U | KAB          | P                  |
|           | Ammonium               | 0.10 ✓        | U |              | AP                 |
|           | Bicarbonate            | 536 ✓         |   |              | T                  |
|           | Carbonate              | 0 ✓           |   |              | T                  |
|           | Chloride               | 95 ✓          | J |              | T                  |
|           | Fluoride               | 1.6 ✓         |   |              | ISE                |
|           | Hydroxide              | 0 ✓           |   |              | T                  |
|           | Nitrate/Nitrite as N   | 3.66 ✓        |   |              | ACR                |
|           | Sulfate                | 150 ✓         |   |              | AM                 |
|           | Total Phosphorus       | 0.31 ✓        |   |              | MA                 |
|           | pH                     | 6.7 ✓         |   |              | B                  |
|           | Specific Conductance   | 1510 ✓        | J |              | E                  |
|           | Total Dissolved Solids | 833 ✓         |   |              | G                  |
|           | Turbidity              | Not required  |   |              | N                  |

11/19/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. Mormon C

Matrix (Soil/Water): Water

Lab Sample ID: 121147

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.11 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | P   |
| 7440-70-2 | Calcium                | 104 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.025 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 74 ✓          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 13.7 ✓        |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | P   |
| 7440-23-5 | Sodium                 | 29 ✓          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 536 ✓         |   |   | T   |
|           | Carbonate              | 0 ✓           |   |   | T   |
|           | Chloride               | 37 ✓          | J |   | T   |
|           | Fluoride               | 12 ✓          |   |   | ISE |
|           | Hydroxide              | 0 ✓           |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.20 ✓        |   |   | ACR |
|           | Sulfate                | 78 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.21 ✓        |   |   | MA  |
|           | pH                     | 6.7 ✓         |   |   | E   |
|           | Specific Conductance   | 1050 ✓        | J |   | E   |
|           | Total Dissolved Solids | 705 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

F193

F KAS

Wet  
11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. Homestead

Matrix (Soil/Water): Water

Lab Sample ID: 121148

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M       |
|-----------|------------------------|---------------|---|---|---------|
| 7429-90-5 | Aluminum               | 0.10 ✓        | ✓ |   | P       |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H       |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | ✓ F KAS |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | P       |
| 7440-70-2 | Calcium                | 102 ✓         |   |   | P       |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P       |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | P       |
| 7439-89-6 | Iron                   | 0.025 ✓       | U |   | P       |
| 7439-92-1 | Lead                   | 0.004 ✓       | U |   | P       |
| 7439-95-4 | Magnesium              | 95 ✓          |   |   | P       |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P       |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | P       |
| 7440-09-7 | Potassium              | 6.1 ✓         |   |   | A       |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H       |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | ✓ F KAS |
| 7440-23-5 | Sodium                 | 31 ✓          |   |   | P       |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | P       |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P       |
|           | Ammonium               | 0.10 ✓        | U |   | AP      |
|           | Bicarbonate            | 724 ✓         |   |   | T       |
|           | Carbonate              | 0 ✓           |   |   | T       |
|           | Chloride               | 17 ✓          |   |   | T       |
|           | Fluoride               | 0.4 ✓         |   |   | ISE     |
|           | Hydroxide              | 0 ✓           |   |   | T       |
|           | Nitrate/Nitrite as N   | 5.50 ✓        |   |   | ACR     |
|           | Sulfate                | 54 ✓          |   |   | AM      |
|           | Total Phosphorus       | 0.24 ✓        | U |   | MA      |
|           | pH                     | 6.8 ✓         |   |   | E       |
|           | Specific Conductance   | 1070 ✓        | J |   | E       |
|           | Total Dissolved Solids | 731 ✓         |   |   | G       |
|           | Turbidity              | Not required  |   |   | N       |

11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-2-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121149

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M                  |
|-----------|------------------------|---------------|---|---|--------------------|
| 7429-90-5 | Aluminum               | 0.13 ✓        | / |   | P                  |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H                  |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | <del>P</del> F KAB |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F                  |
| 7440-70-2 | Calcium                | 116 ✓         |   |   | P                  |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P                  |
| 7440-50-8 | Copper                 | 0.021 ✓       | U |   | F                  |
| 7439-89-6 | Iron                   | 0.069 ✓       | U |   | P                  |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F                  |
| 7439-95-4 | Magnesium              | 60 ✓          |   |   | P                  |
| 7439-96-5 | Manganese              | 0.016 ✓       | U |   | P                  |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F                  |
| 7440-09-7 | Potassium              | 4.8 ✓         |   |   | A                  |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H                  |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | <del>P</del> F KAB |
| 7440-23-5 | Sodium                 | 15 ✓          |   |   | P                  |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F                  |
| 7440-66-6 | Zinc                   | 1.41 ✓        |   |   | P                  |
|           | Ammonium               | 0.10 ✓        | U |   | AP                 |
|           | Bicarbonate            | 472 ✓         |   |   | T                  |
|           | Carbonate              | 0 ✓           |   |   | T                  |
|           | Chloride               | 17 ✓          |   |   | T                  |
|           | Fluoride               | 0.2 ✓         |   |   | ISE                |
|           | Hydroxide              | 0 ✓           |   |   | T                  |
|           | Nitrate/Nitrite as N   | 3.42 ✓        |   |   | ACR                |
|           | Sulfate                | 84 ✓          |   |   | AM                 |
|           | Total Phosphorus       | 0.10 ✓        | U |   | MA                 |
|           | pH                     | 6.5 ✓         |   |   | E                  |
|           | Specific Conductance   | 1020 ✓        | J |   | E                  |
|           | Total Dissolved Solids | 631 ✓         |   |   | G                  |
|           | Turbidity              | Not required  |   |   | N                  |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.Sample No. 02- (1/23/92 MH) FB-01-RFKMatrix (Soil/Water): WaterLab Sample ID: 121150Level (Low/Med): --Date Received: 10/18/91Solids: --Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION      | C              | Q | M                 |
|-----------|------------------------|--------------------|----------------|---|-------------------|
| 7429-90-5 | Aluminum               | 0.02 /             | U              |   | P                 |
| 7440-38-2 | Arsenic                | 0.002 /            | U              |   | H                 |
| 7440-41-7 | Beryllium              | 0.001 /            | U              |   | <del>P</del> F KB |
| 7440-43-9 | Cadmium                | 0.005 /            | U              |   | F                 |
| 7440-70-2 | Calcium                | 0.5 /              | U              |   | P                 |
| 7440-17-3 | Chromium               | 0.01 /             | U              | ✓ | P                 |
| 7440-50-8 | Copper                 | 0.006 /            |                |   | F                 |
| 7439-89-6 | Iron                   | 0.025 /            | U              |   | P                 |
| 7439-92-1 | Lead                   | 0.001 /            |                |   | F                 |
| 7439-95-4 | Magnesium              | 0.5 /              | U              |   | P                 |
| 7439-96-5 | Manganese              | 0.005 /            | U              |   | P                 |
| 7440-02-0 | Nickel                 | 0.02 /             | U              |   | F                 |
| 7440-09-7 | Potassium              | 0.4 /              | U              |   | A                 |
| 7782-49-2 | Selenium               | 0.003 /            | U              |   | H                 |
| 7440-22-4 | Silver                 | 0.01 /             | U              |   | <del>F</del> F KB |
| 7440-23-5 | Sodium                 | 0.09 /             |                |   | P                 |
| 7440-62-2 | Vanadium               | 0.01 - 0.01 - 0.02 | <del>U</del> U |   | P                 |
| 7440-66-6 | Zinc                   | 0.008 /            | U              |   | P                 |
|           | Ammonium               | 0.10 /             | U              |   | AP                |
|           | Bicarbonate            | 0.1 /              | U              |   | T                 |
|           | Carbonate              | 0 /                |                |   | T                 |
|           | Chloride               | 0.1 /              | U              |   | T                 |
|           | Fluoride               | 0.10 /             | U              |   | ISE               |
|           | Hydroxide              | 0 /                |                |   | T                 |
|           | Nitrate/Nitrite as N   | 0.50 /             | U              |   | ACR               |
|           | Sulfate                | 1 /                |                |   | AM                |
|           | Total Phosphorus       | 0.10 /             | U              |   | MA                |
|           | pH                     | 4.8 /              |                |   | E                 |
|           | Specific Conductance   | 10 /               | UJ             |   | E                 |
|           | Total Dissolved Solids | 10 /               | U              |   | G                 |
|           | Turbidity              | Not required       |                |   | N                 |

11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. PW-1-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121153

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION    | C | Q | M   |
|-----------|------------------------|------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.17 ✓           | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓          | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓          | U |   | P   |
| 7440-43-9 | Cadmium                | 0.080 ✓          |   |   | F   |
| 7440-70-2 | Calcium                | 134 ✓            |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓           | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓          | U |   | F   |
| 7439-89-6 | Iron                   | 0.025 ✓          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓          | U |   | F   |
| 7439-95-4 | Magnesium              | 71 ✓             |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓          | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓           | U |   | F   |
| 7440-09-7 | Potassium              | 12.2 ✓           |   |   | A   |
| 7782-49-2 | Selenium               | 0.007 ✓          |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓           | U |   | P   |
| 7440-23-5 | Sodium                 | 44 ✓             |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02 ✓           | U |   | F   |
| 7440-66-6 | Zinc                   | 0.077 ✓          | U |   | P   |
|           | Ammonium               | 0.10 ✓           | U |   | AP  |
|           | Bicarbonate            | 452 ✓            |   |   | T   |
|           | Carbonate              | 0 ✓              |   |   | T   |
|           | Chloride               | 136 ✓            |   |   | T   |
|           | Fluoride               | 1.3 ✓            |   |   | ISE |
|           | Hydroxide              | 0 ✓              |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.10 ✓           |   |   | ACR |
|           | Sulfate                | 162 ✓            |   |   | AM  |
|           | Total Phosphorus       | 1.46 ✓ 1.14 elms |   |   | MA  |
|           | pH                     | 6.7 ✓            |   |   | E   |
|           | Specific Conductance   | 1540 ✓           | U |   | E   |
|           | Total Dissolved Solids | 960 ✓            |   |   | G   |
|           | Turbidity              | Not required     |   |   | N   |

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11/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. PW-2-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121154

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M            |
|-----------|------------------------|---------------|---|---|--------------|
| 7429-90-5 | Aluminum               | 0.12 ✓        | U |   | P            |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H            |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | <del>P</del> |
| 7440-43-9 | Cadmium                | 0.020 ✓       |   |   | F            |
| 7440-70-2 | Calcium                | 119 ✓         |   |   | P            |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P            |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F            |
| 7439-89-6 | Iron                   | 0.027 ✓       |   |   | P            |
| 7439-92-1 | Lead                   | 0.002 ✓       |   |   | F            |
| 7439-95-4 | Magnesium              | 57 ✓          |   |   | P            |
| 7439-96-5 | Manganese              | 0.005 ✓       |   |   | P            |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F            |
| 7440-09-7 | Potassium              | 6.2 ✓         |   |   | A            |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H            |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | <del>P</del> |
| 7440-23-5 | Sodium                 | 20 ✓          |   |   | P            |
| 7440-62-2 | Vanadium               | 0.05 ✓        |   |   | F            |
| 7440-66-6 | Zinc                   | 0.015 ✓       |   |   | P            |
|           | Ammonium               | 0.25 ✓        |   |   | AP           |
|           | Bicarbonate            | 443 ✓         |   |   | T            |
|           | Carbonate              | 0             |   |   | T            |
|           | Chloride               | 28 ✓          |   |   | T            |
|           | Fluoride               | 0.40 ✓        |   |   | ISE          |
|           | Hydroxide              | 0 ✓           |   |   | T            |
|           | Nitrate/Nitrite as N   | 4.05 ✓        |   |   | ACR          |
|           | Sulfate                | 84 ✓          |   |   | AM           |
|           | Total Phosphorus       | 0.54, 54 ✓    |   |   | MA           |
|           | pH                     | 6.7 ✓         |   |   | E            |
|           | Specific Conductance   | 1030 ✓        | J |   | E            |
|           | Total Dissolved Solids | 625 ✓         |   |   | G            |
|           | Turbidity              | Not required  |   |   | N            |

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11/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. PW-3-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121155

Level (Low/Med): -

Date Received: 10/18/91

Solids: -

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.12 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.007 ✓       |   |   | F   |
| 7440-70-2 | Calcium                | 126 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        |   |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.051 ✓       |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 63.55 ✓       |   |   | P   |
| 7439-96-5 | Manganese              | 0.006 ✓       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.04 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 6.1 ✓         |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | P   |
| 7440-23-5 | Sodium                 | 28 ✓          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.16 ✓        |   |   | F   |
| 7440-66-6 | Zinc                   | 0.013 ✓       |   |   | P   |
|           | Ammonium               | 0.26 ✓        | J |   | AP  |
|           | Bicarbonate            | 428 ✓         | J |   | T   |
|           | Carbonate              | 0 ✓           | J |   | T   |
|           | Chloride               | 35 ✓          |   |   | T   |
|           | Fluoride               | 0.34 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           | J |   | T   |
|           | Nitrate/Nitrite as N   | 4.45 ✓        |   |   | ACR |
|           | Sulfate                | 90 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.49 ✓        |   |   | MA  |
|           | pH                     | 6.8 ✓         |   |   | E   |
|           | Specific Conductance   | 1010 ✓        | J |   | E   |
|           | Total Dissolved Solids | 653 ✓         | J |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. PW-4-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121156

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q            | M            |
|-----------|------------------------|---------------|---|--------------|--------------|
| 7429-90-5 | Aluminum               | 0.05 ✓        |   |              | P            |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |              | H            |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |              | <del>P</del> |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |              | F            |
| 7440-70-2 | Calcium                | 120 ✓         |   |              | P            |
| 7440-47-3 | Chromium               | 0.01 ✓        |   | <del>✓</del> | P            |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |              | F            |
| 7439-89-6 | Iron                   | 0.36 ✓        | U |              | P            |
| 7439-92-1 | Lead                   | 0.001 ✓       |   |              | F            |
| 7439-95-4 | Magnesium              | 58 ✓          |   |              | P            |
| 7439-96-5 | Manganese              | 0.007 ✓       |   |              | P            |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |              | F            |
| 7440-09-7 | Potassium              | 4.6 ✓         |   |              | A            |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |              | H            |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |              | <del>✓</del> |
| 7440-23-5 | Sodium                 | 16 ✓          |   |              | P            |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |              | F            |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |              | P            |
|           | Ammonium               | 0.10 ✓        | U |              | AP           |
|           | Bicarbonate            | 427 ✓         |   |              | T            |
|           | Carbonate              | 0 ✓           |   |              | T            |
|           | Chloride               | 14 ✓          |   |              | T            |
|           | Fluoride               | 0.23 ✓        |   |              | ISE          |
|           | Hydroxide              | 0 ✓           |   |              | T            |
|           | Nitrate/Nitrite as N   | 3.80 ✓        |   |              | ACR          |
|           | Sulfate                | 78 ✓          |   |              | AM           |
|           | Total Phosphorus       | 0.10 ✓        |   |              | MA           |
|           | pH                     | 6.8 ✓         |   |              | E            |
|           | Specific Conductance   | 838 ✓         | J |              | E            |
|           | Total Dissolved Solids | 585 ✓         |   |              | G            |
|           | Turbidity              | Not required  |   |              | N            |

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11/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. FB-01-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121157

Level (Low/Med): --

Date Received: 10/18/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION           | C | Q | M                  |
|-----------|------------------------|-------------------------|---|---|--------------------|
| 7429-90-5 | Aluminum               | 0.02 ✓                  | ✓ |   | P                  |
| 7440-38-2 | Arsenic                | 0.002 ✓                 | U |   | H                  |
| 7440-41-7 | Beryllium              | 0.001 ✓                 | U |   | <del>P</del> F KAB |
| 7440-43-9 | Cadmium                | 0.005 ✓                 | U |   | F                  |
| 7440-70-2 | Calcium                | 0.5 ✓                   | U |   | P                  |
| 7440-47-3 | Chromium               | 0.01 ✓                  | U | ✓ | P                  |
| 7440-50-8 | Copper                 | 0.005 ✓                 | U |   | F                  |
| 7439-89-6 | Iron                   | 0.025 ✓                 | U |   | P                  |
| 7439-92-1 | Lead                   | 0.001 ✓                 |   |   | F                  |
| 7439-95-4 | Magnesium              | 0.5 ✓                   | U |   | P                  |
| 7439-96-5 | Manganese              | 0.005 ✓                 | U |   | P                  |
| 7440-02-0 | Nickel                 | 0.02 ✓                  | U |   | F                  |
| 7440-09-7 | Potassium              | 0.4 ✓                   | U |   | A                  |
| 7782-49-2 | Selenium               | 0.003 ✓                 | U |   | H                  |
| 7440-22-4 | Silver                 | 0.01 ✓                  | U |   | <del>P</del> F KAB |
| 7440-23-5 | Sodium                 | 0.10 ✓                  |   |   | P                  |
| 7440-62-2 | Vanadium               | 0.01 ✓                  | U |   | F                  |
| 7440-66-6 | Zinc                   | 0.008 ✓                 | U |   | P                  |
|           | Ammonium               | 0.10 ✓                  | U |   | AP                 |
|           | Bicarbonate            | 1.0 ✓                   |   |   | T                  |
|           | Carbonate              | 0 ✓                     |   |   | T                  |
|           | Chloride               | 0.1 ✓                   | U |   | T                  |
|           | Fluoride               | 0.10, 0.02 ✓ <i>low</i> | U |   | ISE                |
|           | Hydroxide              | 0 ✓                     |   |   | T                  |
|           | Nitrate/Nitrite as N   | 0.50 ✓                  | U |   | ACR                |
|           | Sulfate                | 1 ✓                     |   |   | AM                 |
|           | Total Phosphorus       | 0.10 ✓                  | U |   | MA                 |
|           | pH                     | 5.6 ✓                   |   |   | E                  |
|           | Specific Conductance   | 10 ✓                    | U |   | E                  |
|           | Total Dissolved Solids | 10 ✓                    | U |   | G                  |
|           | Turbidity              | Not required            |   |   | N                  |

*11/13/92*

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-28-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121162

Level (Low/Med): -

Date Received: 10/21/91

Solids: -

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.16 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 203 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | N | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.058 ✓ 0.152 |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 119 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.008 ✓       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 8.4 ✓         |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 31 ✓          |   |   | F   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 1080 ✓        | J |   | T   |
|           | Carbonate              | 0 ✓           | J |   | T   |
|           | Chloride               | 21 ✓          |   |   | T   |
|           | Fluoride               | 0.15 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           | J |   | T   |
|           | Nitrate/Nitrite as N   | 1.38 ✓        |   |   | ACR |
|           | Sulfate                | 78 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.21 ✓        |   |   | MA  |
|           | pH                     | 6.0 ✓         |   |   | E   |
|           | Specific Conductance   | 1640 ✓        | J |   | E   |
|           | Total Dissolved Solids | 976 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-29-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121163

Level (Low/Med): --

Date Received: 10/21/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.18 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 134 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.016 ✓       |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 71 ✓          |   |   | P   |
| 7439-96-5 | Manganese              | 0.028 ✓       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 5.6 ✓         |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | P   |
| 7440-23-5 | Sodium                 | 21 ✓          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 611 ✓         | J |   | T   |
|           | Carbonate              | 0 ✓           | J |   | T   |
|           | Chloride               | 18 ✓          |   |   | T   |
|           | Fluoride               | 0.22 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           | J |   | T   |
|           | Nitrate/Nitrite as N   | 4.25 ✓        |   |   | ACR |
|           | Sulfate                | 90 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.21 ✓        |   |   | MA  |
|           | pH                     | 6.4 ✓         |   |   | E   |
|           | Specific Conductance   | 1040 ✓        | J |   | E   |
|           | Total Dissolved Solids | 667 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

F KAS

F KAS

11/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-9-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121164

Level (Low/Med): --

Date Received: 10/21/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.23 /        | . |   | P   |
| 7440-38-2 | Arsenic                | 0.002 /       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 /       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 /       | U |   | F   |
| 7440-70-2 | Calcium                | 158 /         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 /        | U | A | P   |
| 7440-50-8 | Copper                 | 0.005 /       | U |   | F   |
| 7439-89-6 | Iron                   | 16.8 /        |   |   | P   |
| 7439-92-1 | Lead                   | 0.004 /       |   |   | F   |
| 7439-95-4 | Magnesium              | 179 /         |   |   | P   |
| 7439-96-5 | Manganese              | 0.495 /       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.03 /        |   |   | P   |
| 7440-09-7 | Potassium              | 17.2 /        |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 /       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 /        | U |   | P   |
| 7440-23-5 | Sodium                 | 43 /          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 /        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.011 /       |   |   | P   |
|           | Ammonium               | 0.74 /        | X | 1 | AP  |
|           | Bicarbonate            | 1292 /        | J |   | T   |
|           | Carbonate              | 0 /           | J |   | T   |
|           | Chloride               | 24 /          |   |   | T   |
|           | Fluoride               | 0.34 /        |   |   | ISE |
|           | Hydroxide              | 0 /           | J |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 /        | U |   | ACR |
|           | Sulfate                | 96 /          |   |   | AM  |
|           | Total Phosphorus       | 0.51 /        | U |   | MA  |
|           | pH                     | 6.0 /         |   |   | E   |
|           | Specific Conductance   | 1910 /        | J |   | E   |
|           | Total Dissolved Solids | 1090 /        |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

F 10/21/91

F 10/21/91

Not 1/13/92

Not 1/13/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-21-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121165

Level (Low/Med): --

Date Received: 10/21/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION        | C | Q | M            |
|-----------|------------------------|----------------------|---|---|--------------|
| 7429-90-5 | Aluminum               | <del>0.15</del> 0.18 |   |   | P            |
| 7440-38-2 | Arsenic                | 0.002                | U |   | H            |
| 7440-41-7 | Beryllium              | 0.001                | U |   | <del>P</del> |
| 7440-43-9 | Cadmium                | 0.005                | U |   | P            |
| 7440-70-2 | Calcium                | 60                   |   |   | P            |
| 7440-47-3 | Chromium               | 0.01                 | U |   | P            |
| 7440-50-8 | Copper                 | 0.005                | U |   | P            |
| 7439-89-6 | Iron                   | <del>7.72</del> 77.2 |   |   | P            |
| 7439-92-1 | Lead                   | 0.001                | U |   | P            |
| 7439-95-4 | Magnesium              | 264                  |   |   | P            |
| 7439-96-5 | Manganese              | 0.17                 |   |   | P            |
| 7440-02-0 | Nickel                 | 0.03                 |   |   | P            |
| 7440-09-7 | Potassium              | 20.3                 |   |   | A            |
| 7782-49-2 | Selenium               | 0.003                | U |   | H            |
| 7440-22-4 | Silver                 | 0.01                 | U |   | <del>P</del> |
| 7440-23-5 | Sodium                 | 44                   |   |   | P            |
| 7440-62-2 | Vanadium               | 0.01                 | U |   | P            |
| 7440-66-6 | Zinc                   | 0.008                | U |   | P            |
|           | Ammonium               | 0.36                 | U |   | AP           |
|           | Bicarbonate            | 1416                 | J |   | T            |
|           | Carbonate              | 0                    | J |   | T            |
|           | Chloride               | 21                   |   |   | T            |
|           | Fluoride               | 0.20                 |   |   | ISE          |
|           | Hydroxide              | 0                    | J |   | T            |
|           | Nitrate/Nitrite as N   | 0.50                 | U |   | ACR          |
|           | Sulfate                | 84                   |   |   | AM           |
|           | Total Phosphorus       | 0.79                 |   |   | MA           |
|           | pH                     | 6.1                  |   |   | E            |
|           | Specific Conductance   | 1920                 | J |   | E            |
|           | Total Dissolved Solids | 1120                 |   |   | G            |
|           | Turbidity              | Not required         |   |   | N            |

F1028

F1028

11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. FB-03-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121166

Level (Low/Med): --

Date Received: 10/21/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C  | Q | M   |
|-----------|------------------------|---------------|----|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓        | ✓  |   | P   |
| 7440-38-2 | Arsenic                | -0.002 ✓      | U  |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U  |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U  |   | F   |
| 7440-70-2 | Calcium                | 0.5 ✓         | U  |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U  | ✓ | P   |
| 7440-50-8 | Copper                 | 0.010 ✓       |    |   | F   |
| 7439-89-6 | Iron                   | 0.035 ✓       |    |   | P   |
| 7439-92-1 | Lead                   | 0.003 ✓       |    |   | F   |
| 7439-95-4 | Magnesium              | 0.5 ✓         | U  |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U  |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U  |   | P   |
| 7440-09-7 | Potassium              | 0.4 ✓         | U  |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U  |   | H   |
| 7440-22-4 | Silver                 | 0.03 ✓        |    |   | P   |
| 7440-23-5 | Sodium                 | 0.27 ✓        |    |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U  |   | P   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U  |   | P   |
|           | Ammonium               | 0.10 ✓        | U  |   | AP  |
|           | Bicarbonate            | 0.6 ✓         | J  |   | T   |
|           | Carbonate              | 0 ✓           | J  |   | T   |
|           | Chloride               | 0.2 ✓         |    |   | T   |
|           | Fluoride               | 0.10, 0.2 ✓   | U  |   | ISE |
|           | Hydroxide              | 0 ✓           | J  |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U  |   | ACR |
|           | Sulfate                | 1 ✓           | U  |   | AM  |
|           | Total Phosphorus       | 0.10, 0.5 ✓   | U  |   | MA  |
|           | pH                     | 5.3 ✓         |    |   | E   |
|           | Specific Conductance   | 10 ✓          | UJ |   | E   |
|           | Total Dissolved Solids | 10 ✓          | U  |   | G   |
|           | Turbidity              | Not required  |    |   | N   |

F KAS

F KAS

11/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. TW-34-RFK

Matrix (Soil/Water): Water

Lab Sample ID: 121167

Level (Low/Med): --

Date Received: 10/21/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.13 ✓                 |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                | U |   | F   |
| 7440-70-2 | Calcium                | 74 ✓                   |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                 | U | N | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                | U |   | F   |
| 7439-89-6 | Iron                   | 0.84 ✓                 |   |   | P   |
| 7439-92-1 | Lead                   | 0.006 ✓                |   |   | F   |
| 7439-95-4 | Magnesium              | 72 ✓                   |   |   | P   |
| 7439-96-5 | Manganese              | 0.25 <del>0.27</del> ✓ |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                 | U |   | F   |
| 7440-09-7 | Potassium              | 28.2 ✓                 |   |   | A   |
| 7782-49-2 | Selenium               | 0.003 ✓                | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                 | U |   | F   |
| 7440-23-5 | Sodium                 | 43 ✓                   |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                 | U |   | F   |
| 7440-66-6 | Zinc                   | 0.054 ✓                |   |   | P   |
|           | Ammonium               | 0.10 ✓                 | U |   | AP  |
|           | Bicarbonate            | 448 ✓                  | J |   | T   |
|           | Carbonate              | 0 ✓                    | J |   | T   |
|           | Chloride               | 21 ✓                   |   |   | T   |
|           | Fluoride               | 0.94 ✓                 |   |   | ISE |
|           | Hydroxide              | 0 ✓                    | J |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                 | U |   | ACR |
|           | Sulfate                | 138 ✓                  |   |   | AM  |
|           | Total Phosphorus       | 0.24 ✓                 |   |   | MA  |
|           | pH                     | 7.5 ✓                  |   |   | E   |
|           | Specific Conductance   | 928 ✓                  | J |   | E   |
|           | Total Dissolved Solids | 632 ✓                  |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

F KAS

F KAS

11/13/92

# INORGANIC DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101-.211 SITE Monsanto Soda Spgs

LABORATORY Chem - Northern SAMPLES/MATRIX

121196 - 121204

SDG # 91-942(2) 121266 - 121270

~~121196~~ 121271

## DATA ASSESSMENT SUMMARY

|                         | ICP      | AA        | <sup>wet</sup><br><del>HG</del> Chem | CYANIDE                                   |
|-------------------------|----------|-----------|--------------------------------------|-------------------------------------------|
| 1. HOLDING TIMES        | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u>1</u>                                  |
| 2. CALIBRATIONS         | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u>1</u> <sup>KL</sup> <sub>1/28/92</sub> |
| 3. BLANKS               | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 4. ICS                  | <u>0</u> |           |                                      | <u></u>                                   |
| 5. LCS                  | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 6. DUPLICATE ANALYSIS   | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 7. MATRIX SPIKE         | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 8. MSA                  |          | <u>X'</u> |                                      | <u></u>                                   |
| 9. SERIAL DILUTION      | <u>0</u> |           |                                      | <u></u>                                   |
| 10. SAMPLE VERIFICATION | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 11. OTHER QC            | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |
| 12. OVERALL ASSESSMENT  | <u>0</u> | <u>0</u>  | <u>0</u>                             | <u></u>                                   |

0 = Data had no problems/or qualified due to minor problems.

M = Data qualified due to major problems.

Z = Data unacceptable.

X = Problems, but do not affect data.

NOTES:

1 analytical spikes not performed per SDG Lab Contract

Validated by: Kenneth Miller Date: 2/3/92

Reviewed by: W. H. H. H. H. H. Date: 2/5/92

SDG # 91f942 (2) Project No. 913-1101.211

Acceptable  
YES NO

1. Holding Times ----- ✓ -----

Holding Time acceptable

2. Calibrations ----- ✓ -----

A analyte outside of QC limits Results less than IDL; results acceptable. Verification appropriate number of standard and blanks used.

3. Blanks ----- ✓ -----

NO Contaminates found in Blanks

4. ICP Interference Check Sample (ICS) ----- ✓ -----

ICS within QC limits Recal Al 90R  
 $540/501^{100} = 107.9$

5. Laboratory Control Sample (LCS) ----- ✓ -----

All LCS within QC limits  
Recal LCS 90R Pb  $102\% \cdot 0.023 \cdot 100 = 104.34$   
Error in calculating 90R for Pb

6. Duplicate Sample Analysis ----- ✓ -----

Duplicates within QC limits  
Duplicate analysis acceptable

7. Matrix Spike Sample Analysis ----- ✓ -----

Spike recovery 90R within QC limits for analyte. Recal 90R Al ~~102% = 0.018~~  
 $\frac{134 - 15}{20} \cdot 100 = 100$  acceptable analysis

SDG # 91-942(27) Project No. 913-1101.211

Acceptable  
YES NO

8. Furnace Atomic Absorption QC -----

analytical spikes not run but matrix  
spike acceptable and Internal  
Lab spike acceptable.

9. ICP Serial Dilution -----

Reel 7017 540/501  $\times 100 = 107.7$   
acceptable data

10. Sample Result Verification -----

Results verified and corrected as  
apparent attached forms

11. Field Duplicates -----

N/A

12. Overall Assessment -----

ICP-AAS spikes need to be run in future  
Data meets work plan and  
plus reported to SX CRDLs.

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121196  
 Lab Sample ID: TW-30-CCY  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                       | C  | Q | M   |
|-----------|------------------------|-------------------------------------|----|---|-----|
| 7429-90-5 | Total Aluminum         | 38 <sup>6.5</sup> <del>0.38</del> ✓ |    |   | P   |
| 7440-38-2 | Total Arsenic          | 0.002 ✓                             |    |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓                             | U  |   | F   |
| 7440-43-9 | Total Cadmium          | 0.005 ✓                             | U  |   | F   |
| 7440-70-2 | Total Calcium          | 231 ✓                               |    |   | P   |
| 7440-47-3 | Total Chromium         | 0.01 ✓                              | U  |   | P   |
| 7440-50-8 | Total Copper           | 0.005 ✓                             | U  |   | F   |
| 7439-89-6 | Total Iron             | 1.90 ✓                              |    |   | P   |
| 7439-92-1 | Total Lead             | 0.001 ✓                             | U  |   | F   |
| 7439-95-4 | Total Magnesium        | 156 ✓                               |    |   | P   |
| 7439-96-5 | Total Manganese        | 0.18 ✓                              |    |   | P   |
| 7440-02-0 | Total Nickel           | 0.02 ✓                              | U  |   | F   |
| 7440-09-7 | Total Potassium        | 46.0 ✓                              |    |   | P   |
| 7782-49-2 | Total Selenium         | 0.015 ✓                             |    |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓                              | U  |   | F   |
| 7440-23-5 | Total Sodium           | 195 ✓                               |    |   | P   |
| 7440-62-2 | Total Vanadium         | 0.01 ✓                              | 11 |   | F   |
| 7440-66-6 | Total Zinc             | 0.032 ✓                             |    |   | P   |
|           | Ammonium               | 0.57 ✓                              |    |   | AP  |
|           | Bicarbonate            | 472 ✓                               |    |   | T   |
|           | Carbonate              | 0                                   |    |   | T   |
|           | Chloride               | 313 ✓                               |    |   | T   |
|           | Fluoride               | 3.0 ✓                               |    |   | ISE |
|           | Hydroxide              | 0                                   |    |   | T   |
|           | Nitrate/Nitrite as N   | 12.2 ✓                              |    |   | ACR |
|           | Sulfate                | 360 ✓                               |    |   | AM  |
|           | Total Phosphorus       | 2.3 <sup>2.13</sup> ✓               |    |   | NA  |
|           | pH                     | 6.4 ✓                               |    |   | E   |
|           | Specific Conductance   | 2430 ✓                              |    |   | E   |
|           | Total Dissolved Solids | 1530 ✓                              |    |   | G   |
|           | Turbidity              | Not required                        |    |   | N   |

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*Handwritten:* 2/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121196  
 Lab Sample ID: TW-30-CCY  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION  | C | Q | M   |
|-----------|------------------------|----------------|---|---|-----|
| 7429-90-5 | Dissolved Aluminum     | 0.17           | U |   | P   |
| 7440-38-2 | Dissolved Arsenic      | 0.003          | U |   | H   |
| 7440-41-7 | Dissolved Beryllium    | 0.001          | U |   | F   |
| 7440-43-9 | Dissolved Cadmium      | 0.005          | U |   | F   |
| 7440-70-2 | Dissolved Calcium      | 171            | U |   | P   |
| 7440-47-3 | Dissolved Chromium     | 0.01           | U |   | P   |
| 7440-50-8 | Dissolved Copper       | 0.005          | U |   | F   |
| 7439-89-6 | Dissolved Iron         | 0.042          | U |   | P   |
| 7439-92-1 | Dissolved Lead         | 0.001          | U |   | F   |
| 7439-95-4 | Dissolved Magnesium    | 115            | U |   | P   |
| 7439-96-5 | Dissolved Manganese    | 0.032          | U |   | P   |
| 7440-02-0 | Dissolved Nickel       | 0.02           | U |   | F   |
| 7440-09-7 | Dissolved Potassium    | 46.5           | U |   | P   |
| 7782-49-2 | Dissolved Selenium     | 0.016          | U |   | H   |
| 7440-22-4 | Dissolved Silver       | 0.01           | U |   | F   |
| 7440-23-5 | Dissolved Sodium       | 153            | U |   | P   |
| 7440-62-2 | Dissolved Vanadium     | 0.01           | U |   | F   |
| 7440-66-6 | Dissolved Zinc         | 0.053          | U |   | P   |
|           | Ammonium               | Not applicable |   |   | AP  |
|           | Bicarbonate            | Not applicable |   |   | T   |
|           | Carbonate              | Not applicable |   |   | T   |
|           | Chloride               | Not applicable |   |   | T   |
|           | Fluoride               | Not applicable |   |   | ISE |
|           | Hydroxide              | Not applicable |   |   | T   |
|           | Nitrate/Nitrite as N   | Not applicable |   |   | ACR |
|           | Sulfate                | Not applicable |   |   | AM  |
|           | Total Phosphorus       | Not applicable |   |   | NA  |
|           | pH                     | Not applicable |   |   | E   |
|           | Specific Conductance   | Not applicable |   |   | E   |
|           | Total Dissolved Solids | Not applicable |   |   | G   |
|           | Turbidity              | Not required   |   |   | N   |

*Test*  
*4/16/92*

*Klonie*  
*2/3/92*

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121197  
 Lab Sample ID: EB-01-CCY  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C            | Q | M   |
|-----------|------------------------|---------------|--------------|---|-----|
| 7429-90-5 | Aluminum               | 0.02 ✓        | U            |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U            |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U            |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U            |   | F   |
| 7440-70-2 | Calcium                | 0.5 ✓         | U            |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U            |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U            |   | F   |
| 7439-89-6 | Iron                   | 0.025 ✓       | U            |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U            |   | F   |
| 7439-95-4 | Magnesium              | 0.5 ✓         | U            |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U            |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U            |   | F   |
| 7440-09-7 | Potassium              | 0.4 ✓         | U            |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U            |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U            |   | F   |
| 7440-23-5 | Sodium                 | 0.04 ✓        | U            |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U            |   | F   |
| 7440-66-6 | Zinc                   | 0.009 ✓       | U            |   | P   |
|           | Ammonium               | 0.10 ✓        | U            |   | AP  |
|           | Bicarbonate            | 0.6 ✓         | U            |   | T   |
|           | Carbonate              | 0             |              |   | T   |
|           | Chloride               | 0.10 ✓        | U            |   | T   |
|           | Fluoride               | 0.10, 0.2 ✓   | U            |   | ISE |
|           | Hydroxide              | 0             |              |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U            |   | ACR |
|           | Sulfate                | 1 ✓           | U            |   | AM  |
|           | Total Phosphorus       | 0.46, 0.4 ✓   | <del>X</del> |   | NA  |
|           | pH                     | 4.5 ✓         |              |   | E   |
|           | Specific Conductance   | 15 ✓          |              |   | E   |
|           | Total Dissolved Solids | 10 ✓          | U            |   | G   |
|           | Turbidity              | Not required  |              |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121198  
 Lab Sample ID: TW-26-RFK  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                           | C | Q | M   |
|-----------|------------------------|-----------------------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | <del>10</del> 0.18 <sup>16.6</sup> 33 ✓ | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                                 | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                                 | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                                 | U |   | F   |
| 7440-70-2 | Calcium                | 120 ✓                                   |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                                  | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                                 | U |   | F   |
| 7439-89-6 | Iron                   | 0.22 ✓                                  | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                                 | U |   | F   |
| 7439-95-4 | Magnesium              | 124 ✓                                   |   |   | P   |
| 7439-96-5 | Manganese              | 0.72 ✓                                  |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                                  | U |   | F   |
| 7440-09-7 | Potassium              | 25.5 ✓                                  |   |   | P   |
| 7782-49-2 | Selenium               | 0.007 ✓                                 |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                                  | U |   | F   |
| 7440-23-5 | Sodium                 | 108 ✓                                   |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                                  | U |   | F   |
| 7440-66-6 | Zinc                   | 0.032 ✓                                 | U |   | P   |
|           | Ammonium               | <del>1.08</del> 1.8 ✓                   |   |   | AP  |
|           | Bicarbonate            | 560 ✓                                   |   |   | T   |
|           | Carbonate              | 0                                       |   |   | T   |
|           | Chloride               | 104 ✓                                   |   |   | T   |
|           | Fluoride               | <del>1.8</del> 1.02 ✓                   |   |   | ISE |
|           | Hydroxide              | 0                                       |   |   | T   |
|           | Nitrate/Nitrite as N   | 7.95 ✓                                  |   |   | ACR |
|           | Sulfate                | 360 ✓                                   |   |   | AM  |
|           | Total Phosphorus       | <del>0.87</del> 0.67 ✓                  | U |   | NA  |
|           | pH                     | 6.7 ✓                                   |   |   | E   |
|           | Specific Conductance   | 1730 ✓                                  |   |   | E   |
|           | Total Dissolved Solids | 1180 ✓                                  |   |   | G   |
|           | Turbidity              | Not required                            |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121199  
 Lab Sample ID: TW-13-RFK  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.17 ✓        | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 110 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.070 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 46.4 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.008 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 5.5 ✓         |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 7.6 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.31 ✓        | U |   | AP  |
|           | Bicarbonate            | 498 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 13 ✓          |   |   | T   |
|           | Fluoride               | 0.23 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.84 ✓        |   |   | ACR |
|           | Sulfate                | 34 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.10, 11 ✓    | U |   | NA  |
|           | pH                     | 7.0 ✓         |   |   | E   |
|           | Specific Conductance   | 774 ✓         |   |   | E   |
|           | Total Dissolved Solids | 424 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121200  
 Lab Sample ID: TW-26-RFK-DUP  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C            | Q | M   |
|-----------|------------------------|---------------|--------------|---|-----|
| 7429-90-5 | Aluminum               | 0.12 ✓        | ✓            |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       |              |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U            |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U            |   | F   |
| 7440-70-2 | Calcium                | 123 ✓         |              |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U            |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U            |   | F   |
| 7439-89-6 | Iron                   | 0.27 ✓        | U            |   | P   |
| 7439-92-1 | Lead                   | 0.002 ✓       | U            |   | F   |
| 7439-95-4 | Magnesium              | 126 ✓         |              |   | P   |
| 7439-96-5 | Manganese              | 0.74 ✓        | <del>U</del> |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U            |   | F   |
| 7440-09-7 | Potassium              | 25.0 ✓        |              |   | P   |
| 7782-49-2 | Selenium               | 0.007 ✓       |              |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U            |   | F   |
| 7440-23-5 | Sodium                 | 112 ✓         |              |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U            |   | F   |
| 7440-66-6 | Zinc                   | 0.028 ✓       | U            |   | P   |
|           | Ammonium               | 180/1.7 ✓     |              |   | AP  |
|           | Bicarbonate            | 554 ✓         |              |   | T   |
|           | Carbonate              | 0             |              |   | T   |
|           | Chloride               | 101 ✓         |              |   | T   |
|           | Fluoride               | 1.12 ✓        |              |   | ISE |
|           | Hydroxide              | 0             |              |   | T   |
|           | Nitrate/Nitrite as N   | 7.90 ✓        |              |   | ACR |
|           | Sulfate                | 360 ✓         |              |   | AM  |
|           | Total Phosphorus       | 0.72, 7c ✓    | U            |   | NA  |
|           | pH                     | 6.7 ✓         |              |   | E   |
|           | Specific Conductance   | 1820 ✓        |              |   | E   |
|           | Total Dissolved Solids | 1180 ✓        |              |   | G   |
|           | Turbidity              | Not required  |              |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121201  
 Lab Sample ID: TW-15-RFK  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.09 .86 ✓    |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 117 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.051 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | P   |
| 7439-95-4 | Magnesium              | 47.2 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 3.1 ✓         |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 7.0 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.15 ✓        |   |   | AP  |
|           | Bicarbonate            | 509 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 15 ✓          |   |   | T   |
|           | Fluoride               | 0.24 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | -1.583 ✓      |   |   | ACR |
|           | Sulfate                | 34 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.41, 1.0 ✓   | U |   | NA  |
|           | pH                     | 7.0 ✓         |   |   | E   |
|           | Specific Conductance   | 786 ✓         |   |   | E   |
|           | Total Dissolved Solids | 457 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121202  
 Lab Sample ID: Hooper  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.12 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 120 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 5.92 ✓        |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 130 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.28 ✓        |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 15.0 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 33.4 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.0085 ✓      | U |   | P   |
|           | Ammonium               | 0.54 ✓        | U |   | AP  |
|           | Bicarbonate            | 1002 ✓        |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 23 ✓          |   |   | T   |
|           | Fluoride               | 0.42 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 60 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.25, 27 ✓    | U |   | NA  |
|           | pH                     | 5.9 ✓         |   |   | E   |
|           | Specific Conductance   | 1460 ✓        |   |   | E   |
|           | Total Dissolved Solids | 812 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121203  
 Lab Sample ID: FB-QERFK-TW-44-RFK  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 1.3 <del>0.15</del> ✓  |   |   | P   |
| 7440-38-2 | Total Arsenic          | 0.007 ✓                |   |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓                | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.070 ✓                |   |   | F   |
| 7440-70-2 | Total Calcium          | 59.5 ✓                 |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.04 ✓                 |   |   | P   |
| 7440-50-8 | Total Copper           | 0.011 ✓                | U |   | F   |
| 7439-89-6 | Total Iron             | 5.57 <del>5.25</del> ✓ |   |   | P   |
| 7439-92-1 | Total Lead             | 0.028 ✓                |   |   | F   |
| 7439-95-4 | Total Magnesium        | 190 ✓                  |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.16 ✓                 |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.06 ✓                 |   |   | F   |
| 7440-09-7 | Total Potassium        | 15.4 ✓                 |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.003 ✓                | U |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓                 | U |   | F   |
| 7440-23-5 | Total Sodium           | 33.3 ✓                 |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.02 ✓                 | U |   | F   |
| 7440-66-6 | Total Zinc             | 0.44 ✓                 |   |   | P   |
|           | Ammonium               | 0.47 ✓                 | U |   | AP  |
|           | Bicarbonate            | 1108 ✓                 |   |   | T   |
|           | Carbonate              | 0                      |   |   | T   |
|           | Chloride               | 23 ✓                   |   |   | T   |
|           | Fluoride               | 0.46 ✓                 |   |   | ISE |
|           | Hydroxide              | 0                      |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                 |   |   | ACR |
|           | Sulfate                | 54 ✓                   |   |   | AM  |
|           | Total Phosphorus       | 1.69 <del>1.46</del> ✓ |   |   | NA  |
|           | pH                     | 6.6 ✓                  |   |   | E   |
|           | Specific Conductance   | 1660 ✓                 |   |   | E   |
|           | Total Dissolved Solids | 843 ✓                  |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): —  
 Solids: —

Sample No. 121203  
 Lab Sample ID: FB-0-RFK TW-44-RFK-F  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Dissolved Aluminum     | 0.15          | — |   | P   |
| 7440-38-2 | Dissolved Arsenic      | 0.004         | — |   | H   |
| 7440-41-7 | Dissolved Beryllium    | 0.001         | — | U | F   |
| 7440-43-9 | Dissolved Cadmium      | 0.005         | — | U | F   |
| 7440-70-2 | Dissolved Calcium      | 53.4          | — |   | P   |
| 7440-47-3 | Dissolved Chromium     | 0.01          | — | U | P   |
| 7440-50-8 | Dissolved Copper       | 0.005         | — | U | F   |
| 7439-89-6 | Dissolved Iron         | 1.21          | — |   | P   |
| 7439-92-1 | Dissolved Lead         | 0.001         | — | U | F   |
| 7439-95-4 | Dissolved Magnesium    | 184           | — |   | P   |
| 7439-96-5 | Dissolved Manganese    | 0.17          | — |   | P   |
| 7440-02-0 | Dissolved Nickel       | 0.03          | — |   | F   |
| 7440-09-7 | Dissolved Potassium    | 14.5          | — |   | P   |
| 7782-49-2 | Dissolved Selenium     | 0.003         | — | U | H   |
| 7440-22-4 | Dissolved Silver       | 0.01          | — | U | F   |
| 7440-23-5 | Dissolved Sodium       | 32.8          | — |   | P   |
| 7440-62-2 | Dissolved Vanadium     | 0.01          | — | U | F   |
| 7440-66-6 | Dissolved Zinc         | 0.073         | — | U | P   |
|           | Ammonium               | Not required  |   |   | AP  |
|           | Bicarbonate            | Not required  |   |   | T   |
|           | Carbonate              | Not required  |   |   | T   |
|           | Chloride               | Not required  |   |   | T   |
|           | Fluoride               | Not required  |   |   | ISE |
|           | Hydroxide              | Not required  |   |   | T   |
|           | Nitrate/Nitrite as N   | Not required  |   |   | ACR |
|           | Sulfate                | Not required  |   |   | AM  |
|           | Total Phosphorus       | Not required  |   |   | NA  |
|           | pH                     | Not required  |   |   | E   |
|           | Specific Conductance   | Not required  |   |   | E   |
|           | Total Dissolved Solids | Not required  |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121204  
 Lab Sample ID: FB-04-RFK  
 Date Received: 10/22/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06 ✓        | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | P   |
| 7440-70-2 | Calcium                | 0.7 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | P   |
| 7439-89-6 | Iron                   | 0.025 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.004 ✓       |   |   | P   |
| 7439-95-4 | Magnesium              | 0.5 ✓         | U |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | P   |
| 7440-09-7 | Potassium              | 0.4 ✓         | U |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.03 ✓        |   |   | P   |
| 7440-23-5 | Sodium                 | 0.21 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | P   |
| 7440-66-6 | Zinc                   | 0.013 ✓       |   |   | P   |
|           | Ammonium               | 0.15 ✓        |   |   | AP  |
|           | Bicarbonate            | 3.63 ✓        |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 0.34 ✓        |   |   | T   |
|           | Fluoride               | 0.10, 0.2 ✓   | U |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 1 ✓           |   |   | AM  |
|           | Total Phosphorus       | 0.18, 0.5 ✓   | U |   | NA  |
|           | pH                     | 5.9 ✓         |   |   | E   |
|           | Specific Conductance   | 24 ✓          |   |   | E   |
|           | Total Dissolved Solids | 13 ✓          |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121266  
 Lab Sample ID: TW-39-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.17 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.020 ✓       |   |   | F   |
| 7440-70-2 | Calcium                | 149 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.033 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 130 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 28.4 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.007 ✓       |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 114 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.18 ✓        |   |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 498 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 183 ✓         |   |   | T   |
|           | Fluoride               | 634 ✓         |   |   | ISE |
|           | Hydroxide              |               |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.90 ✓        |   |   | ACR |
|           | Sulfate                | 420 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.38 34 ✓     | U |   | NA  |
|           | pH                     | 6.5 ✓         |   |   | E   |
|           | Specific Conductance   | 2060 ✓        |   |   | E   |
|           | Total Dissolved Solids | 1330 ✓        |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

*4/16/92*

*Klonic  
2/3/92*

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: --

Sample No. 121267  
 Lab Sample ID: TW-12-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.13/1 ✓      |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 224 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 (CD) ✓   | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.024 ✓       |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 83.3 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.10 ✓        |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 47.5 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 590 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.96 ✓        |   |   | F   |
| 7440-66-6 | Zinc                   | 0.036 ✓       | U |   | P   |
|           | Ammonium               | 100 ✓         |   |   | AP  |
|           | Bicarbonate            | 515 ✓         |   |   | T   |
|           | Carbonate              | 0 ✓           |   |   | T   |
|           | Chloride               | 516 ✓         |   |   | T   |
|           | Fluoride               | 0.29 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           |   |   | T   |
|           | Nitrate/Nitrite as N   | 8.60 ✓        |   |   | ACR |
|           | Sulfate                | 1250 ✓        |   |   | AM  |
|           | Total Phosphorus       | 4.82 2.15 ✓   |   |   | NA  |
|           | pH                     | 6.8 ✓         |   |   | E   |
|           | Specific Conductance   | 4620 ✓        |   |   | E   |
|           | Total Dissolved Solids | 2740 ✓        |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

*Handwritten:* 4/16/92

*Handwritten:* Klorie 2/3/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121268  
 Lab Sample ID: TW-35-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.12 ✓        | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 59.6 ✓        |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 3.85 ✓        |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 275 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.12 ✓        |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 15.6 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 31.4 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.009 ✓       | U |   | P   |
|           | Ammonium               | 0.18 ✓        | U |   | AP  |
|           | Bicarbonate            | 1450.2 ✓      |   |   | T   |
|           | Carbonate              | 0 ✓           |   |   | T   |
|           | Chloride               | 39 ✓          |   |   | T   |
|           | Fluoride               | 0.24 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 96 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.49, 33 ✓    | U |   | NA  |
|           | pH                     | 6.3 ✓         |   |   | E   |
|           | Specific Conductance   | 2170 ✓        |   |   | E   |
|           | Total Dissolved Solids | 1240 ✓        |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

*Handwritten:* 4/16/92

*Handwritten:* Klorie 2/3/97

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121269  
 Lab Sample ID: TW-45-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.12 ✓                 |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                | U |   | F   |
| 7440-43-9 | Cadmium                | 0.030 ✓                |   |   | F   |
| 7440-70-2 | Calcium                | 120 ✓                  |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                 | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                | U |   | F   |
| 7439-89-6 | Iron                   | 9.4 <del>11.1</del> ✓  |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                | U |   | F   |
| 7439-95-4 | Magnesium              | 153 ✓                  |   |   | P   |
| 7439-96-5 | Manganese              | 0.64 ✓                 |   |   | P   |
| 7440-02-0 | Nickel                 | 0.03 ✓                 |   |   | F   |
| 7440-09-7 | Potassium              | 28.0 ✓                 |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                 | U |   | F   |
| 7440-23-5 | Sodium                 | 55.4 ✓                 |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                 | U |   | F   |
| 7440-66-6 | Zinc                   | 0.13 ✓                 |   |   | P   |
|           | Ammonium               | 0.90 ✓                 | U |   | AP  |
|           | Bicarbonate            | 1098 <del>87</del> ✓   |   |   | T   |
|           | Carbonate              | 0 ✓                    |   |   | T   |
|           | Chloride               | 65 ✓                   |   |   | T   |
|           | Fluoride               | 1.21 ✓                 |   |   | ISE |
|           | Hydroxide              | 0 ✓                    |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                 | U |   | ACR |
|           | Sulfate                | 70 ✓                   |   |   | AM  |
|           | Total Phosphorus       | 0.41 <del>0.22</del> ✓ | U |   | NA  |
|           | pH                     | 5.8 ✓                  |   |   | E   |
|           | Specific Conductance   | 1930 ✓                 |   |   | E   |
|           | Total Dissolved Solids | 1130 ✓                 |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

*Handwritten:* 4/16/92

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121270  
 Lab Sample ID: TW-10-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.13 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 90.9 ✓        |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.19 ✓        | U |   | P   |
| 7439-92-1 | Lead                   | 0.002 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 69.8 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 13.6 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 100 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.046 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 498 ✓         |   |   | T   |
|           | Carbonate              | 0 ✓           |   |   | T   |
|           | Chloride               | 145 ✓         |   |   | T   |
|           | Fluoride               | 1.8 ✓         |   |   | ISE |
|           | Hydroxide              | 0 ✓           |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.40 ✓        |   |   | ACR |
|           | Sulfate                | 102 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.62, 4.6 ✓   | U |   | NA  |
|           | pH                     | 7.1 ✓         |   |   | E   |
|           | Specific Conductance   | 1410 ✓        |   |   | E   |
|           | Total Dissolved Solids | 756 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121271  
 Lab Sample ID: TW-37-RFK  
 Date Received: 10/23/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.25 ✓                 |   |   | P   |
| 7440-38-2 | Arsenic                | 0.005 ✓                |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                | U |   | F   |
| 7440-43-9 | Cadmium                | 0.389 ✓                |   |   | P   |
| 7440-70-2 | Calcium                | 100 ✓                  |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                 |   |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                | U |   | F   |
| 7439-89-6 | Iron                   | 0.28 ✓                 | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                | U |   | F   |
| 7439-95-4 | Magnesium              | 66.2 ✓                 |   |   | P   |
| 7439-96-5 | Manganese              | 1.07 ✓                 |   |   | P   |
| 7440-02-0 | Nickel                 | 0.13 ✓                 |   |   | F   |
| 7440-09-7 | Potassium              | 46.0 ✓                 |   |   | P   |
| 7782-49-2 | Selenium               | 0.076 ✓                |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                 | U |   | F   |
| 7440-23-5 | Sodium                 | 65.5 ✓                 |   |   | P   |
| 7440-62-2 | Vanadium               | 0.08 ✓                 | U |   | F   |
| 7440-66-6 | Zinc                   | 3.01 ✓                 |   |   | P   |
|           | Ammonium               | 1.32 ✓                 |   |   | AP  |
|           | Bicarbonate            | 417 ✓                  |   |   | T   |
|           | Carbonate              | 0 ✓                    |   |   | T   |
|           | Chloride               | 59 ✓                   |   |   | T   |
|           | Fluoride               | <del>20</del> 19.93 ✓  |   |   | ISE |
|           | Hydroxide              | 0 ✓                    |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.50 ✓                 |   |   | ACR |
|           | Sulfate                | 200 ✓                  |   |   | AM  |
|           | Total Phosphorus       | <del>1.16</del> 1.18 ✓ |   |   | NA  |
|           | pH                     | 6.6 ✓                  |   |   | E   |
|           | Specific Conductance   | 1270 ✓                 |   |   | E   |
|           | Total Dissolved Solids | 772 ✓                  |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

*Handwritten:* 4/16/92

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## INORGANIC DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Mimsanto Soda Spring  
 LABORATORY Chen Northern SAMPLES/MATRIX \_\_\_\_\_

SDG # Part 3 121317 - 121326  
121370 - 121378  
121380 - 121384

## DATA ASSESSMENT SUMMARY

|                         | ICP      | AA        | <del>RG</del> | <del>CYANIDE</del> |
|-------------------------|----------|-----------|---------------|--------------------|
| 1. HOLDING TIMES        | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 2. CALIBRATIONS         | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 3. BLANKS               | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 4. ICS                  | <u>0</u> |           |               |                    |
| 5. LCS                  | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 6. DUPLICATE ANALYSIS   | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 7. MATRIX SPIKE         | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 8. MSA                  |          | <u>X'</u> |               |                    |
| 9. SERIAL DILUTION      | <u>0</u> |           |               |                    |
| 10. SAMPLE VERIFICATION | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 11. OTHER QC            | <u>0</u> | <u>0</u>  | <u>0</u>      |                    |
| 12. OVERALL ASSESSMENT  | <u>0</u> | <u>0</u>  | <u>X'</u>     |                    |

0 = Data had no problems/or qualified due to minor problems.

M = Data qualified due to major problems.

Z = Data unacceptable.

X = Problems, but do not affect data.

## NOTES:

1 - analytical spikes not performed per S&W  
Lab Contract.

Validated by: Kenny Trice

Date: 1/30/92

Reviewed by: Scott Ory

Date: 2/5/92

Part 3

913-1101.211

**YES**

**NO**

1. Holding Times -----

holding time acceptable

## 2. Calibrations -----

3. analyte outside of QC limits but data  
is acceptable verified standards and cal  
blanks used

3. Blanks .....

3 contaminants found in Blank equaling values less than 5x the value with "11"

#### 4. ICP Interference Check Sample (ICS) -----

all TCP with in  $\pm 2\%$  limits of true value. all value acceptable.

5. Laboratory Control Sample (LCS) -----

all CCS acceptable with in  
GC limits of 80-120%

## 6. Duplicate Sample Analysis -----

Products with in Control limits

## 7. Matrix Spike Sample Analysis -----

2. Sample outside of Control Limits  
Requalify K, Na with positive hits with  
"J" Qualifier

SDG # Monsanto Soda Spg Project No. 913-1101.211

Acceptable  
YES NO

8. Furnace Atomic Absorption QC -----

analytical spikes not run but matrix  
spike acceptable and internal  
lab spike acceptable ✓

9. ICP Serial Dilution -----

ICP serial dilution acceptable ✓

10. Sample Result Verification -----

sample results verified against  
raw data ✓

11. Field Duplicates -----

N/A

12. Overall Assessment -----

data usable, meets work plan  
OK's

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121317  
 Sample ID: EB-02-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.04 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 0.5 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.025 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.002 ✓       |   |   | F   |
| 7439-95-4 | Magnesium              | 0.5 ✓         | U |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 0.4 ✓         | U |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 0.10 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.016 ✓       |   |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | ✓             | U |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 0.1 ✓         | U |   | T   |
|           | Fluoride               | 0.10 ✓        | U |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 1 ✓           | U |   | AM  |
|           | Total Phosphorus       | 0.10 ✓        | U |   | NA  |
|           | pH                     | 6.0 —         |   |   | E   |
|           | Specific Conductance   | 10 —          | U |   | E   |
|           | Total Dissolved Solids | 10 ✓          | U |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

U

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121318  
 Sample ID: TW-22-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 0.67 ✓        |   |   | P   |
| 7440-38-2 | Total Arsenic          | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.024 ✓       |   |   | F   |
| 7440-70-2 | Total Calcium          | 139 ✓         |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.04 ✓        |   |   | P   |
| 7440-50-8 | Total Copper           | 0.031 ✓       | U |   | F   |
| 7439-89-6 | Total Iron             | 0.89 ✓        |   |   | P   |
| 7439-92-1 | Total Lead             | 0.017 ✓       | U |   | F   |
| 7439-95-4 | Total Magnesium        | 87.0 ✓        |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.88 ✓        |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.06 ✓        |   |   | F   |
| 7440-09-7 | Total Potassium        | 65 ✓          |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.008 ✓       |   |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Total Sodium           | 96.8 ✓        |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.02 ✓        | U |   | F   |
| 7440-66-6 | Total Zinc             | 0.182 ✓       |   |   | P   |
|           | Ammonium               | 3.9 ✓         |   |   | AP  |
|           | Bicarbonate            | 696 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 62 ✓          |   |   | T   |
|           | Fluoride               | 6.9 ✓         |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 2.80 ✓        |   |   | ACR |
|           | Sulfate                | 270 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.95 ✓        |   |   | NA  |
|           | pH                     | 6.6 ✓         |   |   | E   |
|           | Specific Conductance   | 1.660 ✓       |   |   | E   |
|           | Total Dissolved Solids | 1.070 ✓       |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121318  
 Sample ID: TW-22-RFR  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.10 ✓        |   |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.002 ✓       | U |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001 ✓       | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 0.005 ✓       | U |   | F |
| 7440-70-2 | Dissolved Calcium   | 134 ✓         |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01 ✓        | U | N | P |
| 7440-50-8 | Dissolved Copper    | 0.005 ✓       | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.057 ✓       | U | N | P |
| 7439-92-1 | Dissolved Lead      | 0.001 ✓       | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 89.8 ✓        |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.77 ✓        |   |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.05 ✓        |   |   | F |
| 7440-09-7 | Dissolved Potassium | 61.5 ✓        |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.016 ✓       |   |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01 ✓        | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 95.5 ✓        |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.02 ✓        | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.072 ✓       | U |   | P |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121319  
 Sample ID: TW-23-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.16 ✓        | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 145 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 11.0 ✓        |   | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 149 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.58 ✓        |   |   | P   |
| 7440-02-0 | Nickel                 | 0.04 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 16.4 ✓        | ✓ |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 38.5 ✓        | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.050 ✓       | U |   | P   |
|           | Ammonium               | 0.63 ✓        | U |   | AP  |
|           | Bicarbonate            | 908 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 78 ✓          |   |   | T   |
|           | Fluoride               | 0.59 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 270 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.60 ✓        | U |   | NA  |
|           | pH                     | 6.0 ✓         |   |   | E   |
|           | Specific Conductance   | 1,940 ✓       |   |   | E   |
|           | Total Dissolved Solids | 1,220 ✓       |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: --

Sample No. 121320  
 Sample ID: FB-05-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.04                   | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                | U |   | F   |
| 7440-70-2 | Calcium                | 0.5 ✓                  | U |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                 | U | N | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                | U |   | F   |
| 7439-89-6 | Iron                   | 0.026 ✓                |   | N | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                | U |   | F   |
| 7439-95-4 | Magnesium              | 0.5 ✓                  | U |   | P   |
| 7439-96-5 | Manganese              | 0.005                  | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                 | U |   | F   |
| 7440-09-7 | Potassium              | 0.4 ✓                  | U |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                 | U |   | F   |
| 7440-23-5 | Sodium                 | 0.07 ✓                 | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                 | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓                | U |   | P   |
|           | Ammonium               | 0.19 ✓                 |   |   | AP  |
|           | Bicarbonate            | ✓                      | U |   | T   |
|           | Carbonate              | 0                      |   |   | T   |
|           | Chloride               | 0.10 ✓                 | U |   | T   |
|           | Fluoride               | 0.10 <sup>Klow</sup> ✓ | U |   | ISE |
|           | Hydroxide              | 0                      |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                 | U |   | ACR |
|           | Sulfate                | 1 ✓                    | U |   | AM  |
|           | Total Phosphorus       | 0.10 ✓                 | U |   | NA  |
|           | pH                     | 5.5 ✓                  |   |   | E   |
|           | Specific Conductance   | 10 ✓                   | U |   | E   |
|           | Total Dissolved Solids | 10 ✓                   | U |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121321  
 Sample ID: Southwest  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                | C | Q | M   |
|-----------|------------------------|------------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06                         | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                      | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                      | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                      |   |   | F   |
| 7440-70-2 | Calcium                | 113 ✓                        |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                       | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                      | U |   | F   |
| 7439-89-6 | Iron                   | 0.035 ✓ 0.53 <sup>mg/l</sup> | U | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                      | ✓ |   | F   |
| 7439-95-4 | Magnesium              | 127 ✓                        |   |   | P   |
| 7439-96-5 | Manganese              | 0.015 ✓                      |   |   | P   |
| 7440-02-0 | Nickel                 | 0.03 ✓                       |   |   | F   |
| 7440-09-7 | Potassium              | 15.4 ✓                       | ✓ |   | P   |
| 7782-49-2 | Selenium               | 0.009 ✓                      |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                       | U |   | F   |
| 7440-23-5 | Sodium                 | 38.6 ✓                       | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                       | U |   | F   |
| 7440-66-6 | Zinc                   | 0.075 ✓                      | U |   | P   |
|           | Ammonium               | 0.10 ✓                       | U |   | AP  |
|           | Bicarbonate            | 981 ✓                        |   |   | T   |
|           | Carbonate              | 0                            |   |   | T   |
|           | Chloride               | 21 ✓                         |   |   | T   |
|           | Fluoride               | 1.1 ✓                        |   |   | ISE |
|           | Hydroxide              | 0                            |   |   | T   |
|           | Nitrate/Nitrite as N   | 2.14 ✓                       |   |   | ACR |
|           | Sulfate                | 60 ✓                         |   |   | AM  |
|           | Total Phosphorus       | 0.18 ✓                       | U |   | NA  |
|           | pH                     | 6.5 ✓                        |   |   | E   |
|           | Specific Conductance   | 1,620 ✓                      |   |   | E   |
|           | Total Dissolved Solids | 844 ✓                        |   |   | G   |
|           | Turbidity              | Not required                 |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121322  
 Sample ID: Mormon  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.018 ✓       |   |   | F   |
| 7440-70-2 | Calcium                | 116 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U | ✓ | F   |
| 7439-89-6 | Iron                   | 0.025 ✓       | U | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U | ✓ | F   |
| 7439-95-4 | Magnesium              | 73.0 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 14.6 ✓        | U | ✓ | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 70.2 ✓        | U | ✓ | P   |
| 7440-62-2 | Vanadium               | 0.02 ✓        | U | ✓ | F   |
| 7440-66-6 | Zinc                   | 0.155 ✓       |   |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 551 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 113 ✓         |   |   | T   |
|           | Fluoride               | 22 ✓          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 280 ✓         |   |   | ACR |
|           | Sulfate                | 114 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.31 ✓        | U |   | NA  |
|           | pH                     | 7.2 ✓         |   |   | E   |
|           | Specific Conductance   | 1410 ✓        |   |   | E   |
|           | Total Dissolved Solids | 780 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121323  
 Sample ID: TW-33-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 0.49 ✓        |   |   | P   |
| 7440-38-2 | Total Arsenic          | 0.003 ✓       |   |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Total Calcium          | 117 ✓         |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.02 ✓        |   | ✓ | P   |
| 7440-50-8 | Total Copper           | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Total Iron             | 0.65 ✓        | U | ✓ | P   |
| 7439-92-1 | Total Lead             | 0.004 ✓       | ✓ |   | F   |
| 7439-95-4 | Total Magnesium        | 43.3 ✓        |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.028 ✓       | U |   | P   |
| 7440-02-0 | Total Nickel           | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Total Potassium        | 6.6 ✓         | ✓ |   | P   |
| 7782-49-2 | Total Selenium         | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Total Sodium           | 63.1 ✓        | ✓ |   | P   |
| 7440-62-2 | Total Vanadium         | 2.78 ✓        |   |   | F   |
| 7440-66-6 | Total Zinc             | 0.016 ✓       | U |   | P   |
|           | Ammonium               | 1.96 ✓        |   |   | AP  |
|           | Bicarbonate            | 478 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 128 ✓         |   |   | T   |
|           | Fluoride               | 0.37 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 6.00 ✓        |   |   | ACR |
|           | Sulfate                | 66 ✓          |   |   | AM  |
|           | Total Phosphorus       | 1.06 ✓        |   |   | NA  |
|           | pH                     | 7.2 ✓         |   |   | E   |
|           | Specific Conductance   | 1.130 ✓       |   |   | E   |
|           | Total Dissolved Solids | 608 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121323  
 Sample ID: 740-33  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.07          | / |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.003         | / |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001         | / | U | F |
| 7440-43-9 | Dissolved Cadmium   | 0.005         | / | U | F |
| 7440-70-2 | Dissolved Calcium   | 123           | / |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01          | / | U | P |
| 7440-50-8 | Dissolved Copper    | 0.005         | / | U | F |
| 7439-89-6 | Dissolved Iron      | 0.071         | / | U | P |
| 7439-92-1 | Dissolved Lead      | 0.001         | / | U | F |
| 7439-95-4 | Dissolved Magnesium | 44.2          | / |   | P |
| 7439-96-5 | Dissolved Manganese | 0.027         | / | U | P |
| 7440-02-0 | Dissolved Nickel    | 0.02          | / | U | F |
| 7440-09-7 | Dissolved Potassium | 6.4           | / |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.003         | / | U | H |
| 7440-22-4 | Dissolved Silver    | 0.01          | / | U | F |
| 7440-23-5 | Dissolved Sodium    | 60.9          | / |   | P |
| 7440-62-2 | Dissolved Vanadium  | 2.86          | / |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.011         | / | U | P |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121324  
 Sample ID: TW-48-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.23 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 108 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.009 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.26 ✓        | U | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | ✓ |   | F   |
| 7439-95-4 | Magnesium              | 53.1 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.006 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 4.9 ✓         | ✓ |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 11.3 ✓        | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.04 ✓        | ✓ |   | F   |
| 7440-66-6 | Zinc                   | 0.018 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 472 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 19 ✓          |   |   | T   |
|           | Fluoride               | 0.23 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.15 ✓        |   |   | ACR |
|           | Sulfate                | 72 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.17 ✓        | U |   | NA  |
|           | pH                     | 7.0 ✓         |   |   | E   |
|           | Specific Conductance   | 911 ✓         |   |   | E   |
|           | Total Dissolved Solids | 487 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121325  
 Sample ID: TW-49-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06 ✓        |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | P   |
| 7440-70-2 | Calcium                | 125 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | P   |
| 7439-89-6 | Iron                   | 0.033 ✓       | U | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | P   |
| 7439-95-4 | Magnesium              | 66.1 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | P   |
| 7440-09-7 | Potassium              | 5.1 ✓         | ✓ |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | P   |
| 7440-23-5 | Sodium                 | 13.8 ✓        | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | P   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 544 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 17 ✓          |   |   | T   |
|           | Fluoride               | 0.23 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 3.35 ✓        |   |   | ACR |
|           | Sulfate                | 72 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.13 ✓        | U |   | NA  |
|           | pH                     | 6.7 ✓         |   |   | E   |
|           | Specific Conductance   | 1,010 ✓       |   |   | E   |
|           | Total Dissolved Solids | 572 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121326  
 Sample ID: SW-49-RFK  
 Date Received: 10/24/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.08 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 112 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | P   |
| 7439-89-6 | Iron                   | 0.032 ✓       | U | ✓ | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 58.8 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 4.7 ✓         | U |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 12.1 ✓        | U |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 538 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 19 ✓          |   |   | T   |
|           | Fluoride               | 0.23 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 3.50 ✓        |   |   | ACR |
|           | Sulfate                | 102 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.13 ✓        | U |   | NA  |
|           | pH                     | 6.7 ✓         |   |   | E   |
|           | Specific Conductance   | 1.000 ✓       |   |   | E   |
|           | Total Dissolved Solids | 578 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121370  
 Sample ID: Boy Scout  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION  | C | Q | M   |
|-----------|------------------------|----------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.13 ✓         |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓        | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓        | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓        | U |   | F   |
| 7440-70-2 | Calcium                | 111 ✓          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓         | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓        | U |   | F   |
| 7439-89-6 | Iron                   | 0.18 ✓         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓        | ✓ |   | F   |
| 7439-95-4 | Magnesium              | 48.8 ✓         |   |   | P   |
| 7439-96-5 | Manganese              | 0.010 ✓        | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓         | U |   | F   |
| 7440-09-7 | Potassium              | 26 / 2.6 CAS ✓ |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓        | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓         | U |   | F   |
| 7440-23-5 | Sodium                 | 6.7 ✓          | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓         | U |   | F   |
| 7440-66-6 | Zinc                   | 0.012 ✓        | U |   | P   |
|           | Ammonium               | 0.18 ✓         | U |   | AP  |
|           | Bicarbonate            | 491 ✓          |   |   | T   |
|           | Carbonate              | 0              |   |   | T   |
|           | Chloride               | 10 ✓           |   |   | T   |
|           | Fluoride               | 0.26 ✓         |   |   | ISE |
|           | Hydroxide              | 0              |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓         | U |   | ACR |
|           | Sulfate                | 36 ✓           |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓         | U |   | NA  |
|           | pH                     | 7.7 ✓          |   |   | E   |
|           | Specific Conductance   | 718 ✓          |   |   | E   |
|           | Total Dissolved Solids | 398 212 ✓      |   |   | G   |
|           | Turbidity              | Not required   |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121371  
 Sample ID: Spring Box  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION             | C | Q | M   |
|-----------|------------------------|---------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.13 ✓                    | ✓ |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                   | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                   | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                   | U |   | F   |
| 7440-70-2 | Calcium                | 109 ✓                     |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                    | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                   | U |   | F   |
| 7439-89-6 | Iron                   | 0.080 ✓                   | U |   | P   |
| 7439-92-1 | Lead                   | 0.002 ✓                   | ✓ |   | F   |
| 7439-95-4 | Magnesium              | 47.1 ✓                    |   |   | P   |
| 7439-96-5 | Manganese              | 0.007 ✓                   | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                    | U |   | F   |
| 7440-09-7 | Potassium              | ✓ 25 / 2.6 <del>KAS</del> |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                   | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                    | U |   | F   |
| 7440-23-5 | Sodium                 | 6.5 ✓                     | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                    | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 <del>2.6</del> ✓    | U |   | P   |
|           | Ammonium               | 0.10 ✓                    | U |   | AP  |
|           | Bicarbonate            | 503 ✓                     |   |   | T   |
|           | Carbonate              | 0                         |   |   | T   |
|           | Chloride               | 8 ✓                       |   |   | T   |
|           | Fluoride               | 0.26 ✓                    |   |   | ISE |
|           | Hydroxide              | 0                         |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                    | U |   | ACR |
|           | Sulfate                | 36 ✓                      |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓                    | U |   | NA  |
|           | pH                     | 7.4 ✓                     |   |   | E   |
|           | Specific Conductance   | 752 ✓                     |   |   | E   |
|           | Total Dissolved Solids | 428 ✓                     |   |   | G   |
|           | Turbidity              | Not required              |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No.: 121372  
 Sample ID: Finch  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 150 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.030 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.007 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 57.0 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 5.3 / 4.7 ✓   |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 69.9 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008 ✓       | U |   | P   |
|           | Ammonium               | 1.44 ✓        |   |   | AP  |
|           | Bicarbonate            | 478 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 156 ✓         |   |   | T   |
|           | Fluoride               | 0.25 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.85 ✓        |   |   | ACR |
|           | Sulfate                | 66 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓        | U |   | NA  |
|           | pH                     | 7.0 ✓         |   |   | E   |
|           | Specific Conductance   | 1360 ✓        |   |   | E   |
|           | Total Dissolved Solids | 706 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No.: 121373  
 Sample ID: Formation A  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Calcium                | 162 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.035 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | U |   | F   |
| 7439-95-4 | Magnesium              | 43.0 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | P   |
| 7440-09-7 | Potassium              | ✓ 1.4 / 1.7 ✓ |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 4.3 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.012 ✓       | U |   | P   |
|           | Ammonium               | 0.010 ✓       | U |   | AP  |
|           | Bicarbonate            | 599 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 5 ✓           |   |   | T   |
|           | Fluoride               | 0.29 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 30 ✓          |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓        | U |   | NA  |
|           | pH                     | 6.6 ✓         |   |   | E   |
|           | Specific Conductance   | 968 ✓         |   |   | E   |
|           | Total Dissolved Solids | 546 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): ---  
 Solids: ---

Sample No.: 121374  
 Sample ID: Ledger A  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION         | C | Q | M   |
|-----------|------------------------|-----------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓                | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓               | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓               | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓               | U |   | F   |
| 7440-70-2 | Calcium                | 127 ✓                 |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 <sup>601</sup> ✓ | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓               | U |   | F   |
| 7439-89-6 | Iron                   | 0.034 ✓               | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓               |   |   | F   |
| 7439-95-4 | Magnesium              | 45.1 ✓                |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓               | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                | U |   | F   |
| 7440-09-7 | Potassium              | 1.7 / 1.9 ✓           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓               | U |   | H   |
| 7430-22-4 | Silver                 | 0.01 ✓                | U |   | F   |
| 7440-23-5 | Sodium                 | 5.4 ✓                 |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                | U |   | F   |
| 7440-66-6 | Zinc                   | 0.009 ✓               | U |   | P   |
|           | Ammonium               | 0.10 ✓                | U |   | AP  |
|           | Bicarbonate            | 527 ✓                 |   |   | T   |
|           | Carbonate              | 0                     |   |   | T   |
|           | Chloride               | 7 ✓                   |   |   | T   |
|           | Fluoride               | 0.24 ✓                |   |   | ISE |
|           | Hydroxide              | 0                     |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                | U |   | ACR |
|           | Sulfate                | 30 ✓                  |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓                | U |   | NA  |
|           | pH                     | 7.1 ✓                 |   |   | E   |
|           | Specific Conductance   | 780 ✓                 |   |   | E   |
|           | Total Dissolved Solids | 442 ✓                 |   |   | G   |
|           | Turbidity              | Not required          |   |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
Matrix (Soil/Water): Water  
Level (Low/Med): -  
Solids: -

Sample No.: 121375  
Sample ID: Ledger B  
Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                | C  | Q | M   |
|-----------|------------------------|------------------------------|----|---|-----|
| 7429-90-5 | Aluminum               | 0.05, 0.08 <sup>10</sup> ✓   | U. |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                      | U  |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                      | U  |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓                      | U  |   | F   |
| 7440-70-2 | Calcium                | 129 ✓                        |    |   | P   |
| 7440-47-3 | Chromium               | 0.01, 0.01 <sup>10</sup> ✓   | U  |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                      | U  |   | F   |
| 7439-89-6 | Iron                   | 0.029 ✓                      | U  |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                      | ✓  |   | P   |
| 7439-95-4 | Magnesium              | 46 ✓                         |    |   | P   |
| 7439-96-5 | Manganese              | 0.005, 0.005 <sup>10</sup> ✓ | U  |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                       | U  |   | P   |
| 7440-09-7 | Potassium              | ✓ 1.6 / 1.9 <sup>10</sup> ✓  |    |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                      | U  |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                       | U  |   | F   |
| 7440-23-5 | Sodium                 | 5.5 ✓                        | ✓  |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                       | U  |   | P   |
| 7440-66-6 | Zinc                   | 0.009 ✓                      | U  |   | P   |
|           | Ammonium               | 0.10 ✓                       | U  |   | AP  |
|           | Bicarbonate            | 527 ✓                        |    |   | T   |
|           | Carbonate              | 0                            |    |   | T   |
|           | Chloride               | 7 ✓                          |    |   | T   |
|           | Fluoride               | 0.21 ✓                       |    |   | ISE |
|           | Hydroxide              | 0                            |    |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                       | U  |   | ACR |
|           | Sulfate                | 30 ✓                         |    |   | AM  |
|           | Total Phosphorus       | 0.10 ✓                       | U  |   | NA  |
|           | pH                     | 7.2 ✓                        |    |   | E   |
|           | Specific Conductance   | 768 ✓                        |    |   | E   |
|           | Total Dissolved Solids | 410 ✓                        |    |   | G   |
|           | Turbidity              | Not required                 |    |   | N   |

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No.: 121376  
 Sample ID: Formation B  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION     | C | Q | M   |
|-----------|------------------------|-------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.11 ✓            | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓           | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓           | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005 ✓           | U |   | F   |
| 7440-70-2 | Calcium                | 157 ✓             |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓            | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓           | U |   | F   |
| 7439-89-6 | Iron                   | 0.042 ✓           | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓           |   |   | F   |
| 7439-95-4 | Magnesium              | 43.6 ✓            |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓           | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓            | U |   | P   |
| 7440-09-7 | Potassium              | 1.5 / 1.6 / 1.8 ✓ |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓           | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓            | U |   | F   |
| 7440-23-5 | Sodium                 | 4.6 ✓             |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓            | U |   | F   |
| 7440-66-6 | Zinc                   | 0.020 ✓           | U |   | P   |
|           | Ammonium               | 0.43 ✓            |   |   | AP  |
|           | Bicarbonate            | 527 ✓             |   |   | T   |
|           | Carbonate              | 0                 |   |   | T   |
|           | Chloride               | 10 ✓              |   |   | T   |
|           | Fluoride               | 0.23 ✓            |   |   | ISE |
|           | Hydroxide              | 0                 |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓            | U |   | ACR |
|           | Sulfate                | 30 ✓              |   |   | AM  |
|           | Total Phosphorus       | 0.10 ✓            | U |   | NA  |
|           | pH                     | 7.5 ✓             |   |   | E   |
|           | Specific Conductance   | 718 ✓             |   |   | E   |
|           | Total Dissolved Solids | 412 ✓             |   |   | G   |
|           | Turbidity              | Not required      |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No.: 121377  
 Sample ID: EB-03-CCY  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C            | Q | M   |
|-----------|------------------------|---------------|--------------|---|-----|
| 7429-90-5 | Aluminum               | 0.17 ✓        | <del>X</del> |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U            |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U            |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓       | U            |   | P   |
| 7440-70-2 | Calcium                | 0.5 ✓         |              |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U            |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U            |   | F   |
| 7439-89-6 | Iron                   | 0.168 ✓       |              |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       | ✓            |   | P   |
| 7439-95-4 | Magnesium              | 0.5 ✓         | U            |   | P   |
| 7439-96-5 | Manganese              | 0.011 ✓       |              |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U            |   | P   |
| 7440-09-7 | Potassium              | 0.4 ✓         | U            |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U            |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U            |   | P   |
| 7440-23-5 | Sodium                 | 0.06 ✓        | ✓            |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓        | U            |   | P   |
| 7440-66-6 | Zinc                   | 0.014 ✓       |              |   | P   |
|           | Ammonium               | 0.10 ✓        | U            |   | AP  |
|           | Bicarbonate            | 0.04 ✓        | 0.4 ✓        |   | T   |
|           | Carbonate              | 0             |              |   | T   |
|           | Chloride               | 0.1 ✓         | U            |   | T   |
|           | Fluoride               | 0.10          | U            |   | ISE |
|           | Hydroxide              | 0             |              |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U            |   | ACR |
|           | Sulfate                | 1 ✓           | U            |   | AM  |
|           | Total Phosphorus       | 0.14 ✓        |              |   | NA  |
|           | pH                     | 5.8 ✓         |              |   | E   |
|           | Specific Conductance   | 10 ✓          | U            |   | E   |
|           | Total Dissolved Solids | 10 ✓          | U            |   | G   |
|           | Turbidity              | Not required  |              |   | N   |

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No.: 121378  
 Sample ID: TW-38-CCY  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION  | C | Q | M   |
|-----------|------------------------|----------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 8.2 ✓          |   |   | P   |
| 7440-38-2 | Total Arsenic          | 0.005 ✓        |   |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓        | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.005 ✓        | U |   | F   |
| 7440-70-2 | Total Calcium          | 164 ✓          |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.01 ✓         | U |   | P   |
| 7440-50-8 | Total Copper           | 0.017 ✓        | U |   | F   |
| 7439-89-6 | Total Iron             | 16.4 ✓         |   |   | P   |
| 7439-92-1 | Total Lead             | 0.015 ✓        | U |   | F   |
| 7439-95-4 | Total Magnesium        | 64.2 ✓         |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.181 ✓        |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.02 ✓         |   |   | F   |
| 7440-09-7 | Total Potassium        | ✓ 10.2 / 9.5 ✓ |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.003 ✓        | U |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓         | U |   | F   |
| 7440-23-5 | Total Sodium           | 86.5 ✓         |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.18 ✓         | U |   | F   |
| 7440-66-6 | Total Zinc             | 0.041 ✓        | U |   | P   |
|           | Ammonium               | 2.48 2.1 ✓     |   |   | AP  |
|           | Bicarbonate            | 472 ✓          |   |   | T   |
|           | Carbonate              | 0              |   |   | T   |
|           | Chloride               | 86 ✓           |   |   | T   |
|           | Fluoride               | 0.24           |   |   | ISE |
|           | Hydroxide              | 0              |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.77 ✓         |   |   | ACR |
|           | Sulfate                | 200 ✓          |   |   | AM  |
|           | Total Phosphorus       | 1.04 ✓         |   |   | NA  |
|           | pH                     | 7.2 ✓          |   |   | E   |
|           | Specific Conductance   | 1,380 ✓        |   |   | E   |
|           | Total Dissolved Solids | 812 ✓          |   |   | G   |
|           | Turbidity              | Not required   |   |   | N   |

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4/16/92

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No.: 121378  
 Sample ID: TW-38-CCY  
 Date Received: 10/26/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.07          | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.002         | U |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001         | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 0.005         | U |   | F |
| 7440-70-2 | Dissolved Calcium   | 145           |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01          | U |   | P |
| 7440-50-8 | Dissolved Copper    | 0.005         | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.038         | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001         | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 572           |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.008         | U |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.02          | U |   | F |
| 7440-09-7 | Dissolved Potassium | 8.8 / 85      |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.003         | U |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01          | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 83.5          |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.18          | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.016         | U |   | P |

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 8/19/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121380  
 Sample ID: TW-50-RFK  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 12.3 ✓        |   |   | P   |
| 7440-38-2 | Total Arsenic          | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.005 ✓       | U |   | F   |
| 7440-70-2 | Total Calcium          | 111 ✓         |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.01 ✓        |   |   | P   |
| 7440-50-8 | Total Copper           | 0.012 ✓       | U |   | F   |
| 7439-89-6 | Total Iron             | 13.4 ✓        |   |   | P   |
| 7439-92-1 | Total Lead             | 0.002 ✓       |   |   | F   |
| 7439-95-4 | Total Magnesium        | 154 ✓         |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.59 ✓        |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.03 ✓        |   |   | F   |
| 7440-09-7 | Total Potassium        | 14.6 ✓        |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Total Silver           | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Total Sodium           | 65.2 ✓        |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.01 ✓        | U |   | F   |
| 7440-66-6 | Total Zinc             | 0.048 ✓       | U |   | P   |
|           | Ammonium               | 0.18 ✓        | U |   | AP  |
|           | Bicarbonate            | 472 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 183 ✓         |   |   | T   |
|           | Fluoride               | 0.56 ✓        |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓        | U |   | ACR |
|           | Sulfate                | 300 ✓         |   |   | AM  |
|           | Total Phosphorus       | 0.97 ✓        |   |   | NA  |
|           | pH                     | 7.1 ✓         |   |   | E   |
|           | Specific Conductance   | 1,780 ✓       |   |   | E   |
|           | Total Dissolved Solids | 992 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121380  
 Lab Sample ID: 74-50  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.10 ✓        | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.002 ✓       | U |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001 ✓       | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 0.005 ✓       | U |   | F |
| 7440-70-2 | Dissolved Calcium   | 134 ✓         |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01 ✓        | U |   | P |
| 7440-50-8 | Dissolved Copper    | 0.005 ✓       | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.057 ✓       | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001 ✓       | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 89.8 ✓        |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.77 ✓        |   |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.02 ✓        |   |   | F |
| 7440-09-7 | Dissolved Potassium | 61.5 ✓        |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.003 ✓       | U |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01 ✓        | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 95.5 ✓        |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.02 ✓        | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.072 ✓       | U |   | P |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): -  
 Solids: -

Sample No. 121381  
 Sample ID: Harris  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                                              | C | Q                                   | M   |
|-----------|------------------------|------------------------------------------------------------|---|-------------------------------------|-----|
| 7429-90-5 | Aluminum               | <del>0.07</del> 0.04 <input checked="" type="checkbox"/>   | U |                                     | P   |
| 7440-38-2 | Arsenic                | 0.002 <input checked="" type="checkbox"/>                  | U |                                     | H   |
| 7440-41-7 | Beryllium              | 0.001 <input checked="" type="checkbox"/>                  | U |                                     | F   |
| 7440-43-9 | Cadmium                | 0.005 <input checked="" type="checkbox"/>                  | U |                                     | F   |
| 7440-70-2 | Calcium                | 142 <input checked="" type="checkbox"/>                    |   |                                     | P   |
| 7440-47-3 | Chromium               | 0.01 <input checked="" type="checkbox"/>                   | U | <input checked="" type="checkbox"/> | P   |
| 7440-50-8 | Copper                 | 0.008 <input checked="" type="checkbox"/>                  | U |                                     | F   |
| 7439-89-6 | Iron                   | 0.29 <input checked="" type="checkbox"/>                   | U |                                     | P   |
| 7439-92-1 | Lead                   | 0.001 <input checked="" type="checkbox"/>                  |   |                                     | F   |
| 7439-95-4 | Magnesium              | 50.9 <input checked="" type="checkbox"/>                   |   |                                     | P   |
| 7439-96-5 | Manganese              | 0.005 <del>0.002</del> <input checked="" type="checkbox"/> | U |                                     | P   |
| 7440-02-0 | Nickel                 | 0.02 <input checked="" type="checkbox"/>                   | U |                                     | F   |
| 7440-09-7 | Potassium              | 6.2 <input checked="" type="checkbox"/>                    |   |                                     | P   |
| 7782-49-2 | Selenium               | 0.003 <input checked="" type="checkbox"/>                  | U |                                     | H   |
| 7440-22-4 | Silver                 | 0.01 <input checked="" type="checkbox"/>                   | U |                                     | F   |
| 7440-23-5 | Sodium                 | 7.4 <input checked="" type="checkbox"/>                    |   |                                     | P   |
| 7440-62-2 | Vanadium               | 0.01 <input checked="" type="checkbox"/>                   | U |                                     | F   |
| 7440-66-6 | Zinc                   | 0.018 <input checked="" type="checkbox"/>                  | U |                                     | P   |
|           | Ammonium               | 0.10 <input checked="" type="checkbox"/>                   | U |                                     | AP  |
|           | Bicarbonate            | 638 <input checked="" type="checkbox"/>                    |   |                                     | T   |
|           | Carbonate              | 0                                                          |   |                                     | T   |
|           | Chloride               | 7 <input checked="" type="checkbox"/>                      |   |                                     | T   |
|           | Fluoride               | 0.66 <input checked="" type="checkbox"/>                   |   |                                     | ISE |
|           | Hydroxide              | 0                                                          |   |                                     | T   |
|           | Nitrate/Nitrite as N   | 0.50 <input checked="" type="checkbox"/>                   | U |                                     | ACR |
|           | Sulfate                | 30 <input checked="" type="checkbox"/>                     |   |                                     | AM  |
|           | Total Phosphorus       | 0.16 <input checked="" type="checkbox"/>                   | U |                                     | NA  |
|           | pH                     | 7.0 <input checked="" type="checkbox"/>                    |   |                                     | E   |
|           | Specific Conductance   | 956 <input checked="" type="checkbox"/>                    |   |                                     | E   |
|           | Total Dissolved Solids | 532 <input checked="" type="checkbox"/>                    |   |                                     | G   |
|           | Turbidity              | Not required                                               |   |                                     | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121382  
 Sample ID: Lewis  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION                         | C | Q | M   |
|-----------|------------------------|---------------------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | <del>0.07</del> 0.052 <sup>KL</sup> ✓ | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 ✓                               | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                               | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓                               | U |   | P   |
| 7440-70-2 | Calcium                | 163 ✓                                 |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                                | U | ✓ | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                               | U |   | P   |
| 7439-89-6 | Iron                   | 0.025 <sup>0.22 KL</sup> ✓            | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                               | U |   | P   |
| 7439-95-4 | Magnesium              | 96.2 ✓                                |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓                               | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                                | U |   | F   |
| 7440-09-7 | Potassium              | 9.4 ✓                                 |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                               | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                                | U |   | F   |
| 7440-23-5 | Sodium                 | 49.8 ✓                                |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                                | U |   | F   |
| 7440-66-6 | Zinc                   | 0.220 ✓                               |   |   | P   |
|           | Ammonium               | 0.13 ✓                                |   |   | AP  |
|           | Bicarbonate            | 599 ✓                                 |   |   | T   |
|           | Carbonate              | 0                                     |   |   | T   |
|           | Chloride               | 76 ✓                                  |   |   | T   |
|           | Fluoride               | 0.42 ✓                                |   |   | ISE |
|           | Hydroxide              | 0                                     |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.65 ✓                                |   |   | ACR |
|           | Sulfate                | 220 ✓                                 |   |   | AM  |
|           | Total Phosphorus       | 0.16 ✓                                | U |   | NA  |
|           | pH                     | 6.8 ✓                                 |   |   | E   |
|           | Specific Conductance   | 1500 ✓                                |   |   | E   |
|           | Total Dissolved Solids | 930 ✓                                 |   |   | G   |
|           | Turbidity              | Not required                          |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121383  
 Sample ID: TW-16-RFK  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 ✓        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.020 ✓       |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.626 ✓       |   |   | P   |
| 7440-70-2 | Calcium                | 129 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓       | U |   | F   |
| 7439-89-6 | Iron                   | 0.029 ✓       | U |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       |   |   | F   |
| 7439-95-4 | Magnesium              | 79.8 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.078 ✓       |   |   | P   |
| 7440-02-0 | Nickel                 | 0.04 ✓        |   |   | F   |
| 7440-09-7 | Potassium              | 12.3 ✓        |   |   | P   |
| 7782-49-2 | Selenium               | 0.090 ✓       |   |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 53.9 ✓        |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02 ✓        |   |   | F   |
| 7440-66-6 | Zinc                   | 2.54 ✓        |   |   | P   |
|           | Ammonium               | 0.16 ✓        | U |   | AP  |
|           | Bicarbonate            | 720 ✓         |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 46 ✓          |   |   | T   |
|           | Fluoride               | 4.1 ✓         |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.20 ✓        |   |   | ACR |
|           | Sulfate                | 150 ✓         |   |   | AM  |
|           | Total Phosphorus       | 1.32 ✓        |   |   | NA  |
|           | pH                     | 6.4 ✓         |   |   | E   |
|           | Specific Conductance   | 1.430 ✓       |   |   | E   |
|           | Total Dissolved Solids | 830 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.  
 Matrix (Soil/Water): Water  
 Level (Low/Med): --  
 Solids: --

Sample No. 121384  
 Sample ID: TW-18-RFK  
 Date Received: 10/25/91

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION            | C | Q | M   |
|-----------|------------------------|--------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.07, 0.6 <i>Klow</i> ✓  | U |   | P   |
| 7440-38-2 | Arsenic                | 0.003 ✓                  |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓                  | U |   | P   |
| 7440-43-9 | Cadmium                | 0.005 ✓                  | U |   | F   |
| 7440-70-2 | Calcium                | 88.5 ✓                   |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓                   | U |   | P   |
| 7440-50-8 | Copper                 | 0.005 ✓                  | U |   | F   |
| 7439-89-6 | Iron                   | 2.77, 6.74 <i>Klow</i> ✓ |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓                  |   |   | F   |
| 7439-95-4 | Magnesium              | 190 ✓                    |   |   | P   |
| 7439-96-5 | Manganese              | 0.29 ✓                   |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓                   | U |   | F   |
| 7440-09-7 | Potassium              | 21.9 ✓                   |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓                  | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓                   | U |   | F   |
| 7440-23-5 | Sodium                 | 42.8 ✓                   |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01 ✓                   | U |   | P   |
| 7440-66-6 | Zinc                   | 0.010 ✓                  | U |   | P   |
|           | Ammonium               | 0.35 ✓                   | U |   | AP  |
|           | Bicarbonate            | 1.3401 <i>Klow</i> ✓     |   |   | T   |
|           | Carbonate              | 0                        |   |   | T   |
|           | Chloride               | 17 ✓                     |   |   | T   |
|           | Fluoride               | 0.23 ✓                   |   |   | ISE |
|           | Hydroxide              | 0                        |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50 ✓                   | U |   | ACR |
|           | Sulfate                | 60 ✓                     |   |   | AM  |
|           | Total Phosphorus       | 0.35 ✓                   | U |   | NA  |
|           | pH                     | 6.0 ✓                    |   |   | E   |
|           | Specific Conductance   | 2.000 ✓                  |   |   | E   |
|           | Total Dissolved Solids | 1.040 <i>Klow</i> ✓      |   |   | G   |
|           | Turbidity              | Not required             |   |   | N   |

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*2/9/92*

# INORGANIC DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Soda Spring  
 LABORATORY Chen Northern SAMPLES/MATRIX ~~Soil~~ water  
 SDG # part 4 121467 → 121987  
121512 → 121515  
121588

## DATA ASSESSMENT SUMMARY

|                         | ICP        | AA         | <del>Wet Chemistry</del><br>HG | CYANIDE       |
|-------------------------|------------|------------|--------------------------------|---------------|
| 1. HOLDING TIMES        | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |
| 2. CALIBRATIONS         | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |
| 3. BLANKS               | <u>0</u>   | <u>0</u>   | <u>0</u>                       | <u>2/line</u> |
| 4. ICS                  | <u>0</u>   |            |                                |               |
| 5. LCS                  | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |
| 6. DUPLICATE ANALYSIS   | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |
| 7. MATRIX SPIKE         | <u>0</u>   | <u>0</u>   | <u>X'</u>                      |               |
| 8. MSA                  |            | <u>N/A</u> |                                |               |
| 9. SERIAL DILUTION      | <u>0</u>   |            |                                |               |
| 10. SAMPLE VERIFICATION | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |
| 11. OTHER QC            | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>                     |               |
| 12. OVERALL ASSESSMENT  | <u>0</u>   | <u>0</u>   | <u>0</u>                       |               |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: X' No analytical spikes ran but  
Data OK

MISSING Data for Se 121467-121477

Validated by: Kennedy/Trine Date: 2/10/92  
 Reviewed by: Matthew Campbell Date: 2/24/92

SDG #

Part 4

Project No.

913-1101.211

Acceptable  
YES NO

1. Holding Times ----- ✓ -----

holding Time acceptable  
analyzed within 6 months  
for metals

2. Calibrations ----- ✓ -----

all Initial Calibration and continuing  
Calibration within QC limits  
of 80-120% R, Data acceptable

3. Blanks ----- ✓ -----

Re Qualify lead for 5x the Blank  
value, where sample results less  
than Blank results

4. ICP Interference Check Sample (ICS) ----- ✓ -----

acceptable  
Requal ICS cr.  $82/1.00 \times 100 = 82$

5. Laboratory Control Sample (LCS) ----- ✓ -----

Requalify results with "UJ" for  
90 R in 50-79% range and  
undetected

6. Duplicate Sample Analysis ----- ✓ -----

ph outside of QC limits with quality  
results with "J".  
Data acceptable

7. Matrix Spike Sample Analysis ----- ✓ -----

acceptable - all 90 R  
within limits of QC

SDG # Part 4 Project No. 913-1101, 211

Acceptable  
YES NO

8. Furnace Atomic Absorption QC -----

analytical spikes not run but matrix  
spikes acceptable and Internal  
Lab spike Acceptable

9. ICP Serial Dilution -----

data acceptable

10. Sample Result Verification -----

acceptable

11. Field Duplicates -----

N/A

12. Overall Assessment -----

GFAA spikes need to be run in  
future

- Blanks Qualified on form 1's

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121467

Matrix (Soil/Water): Water

Sample ID: Ledger C

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.07          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 123           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.025         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 43.1          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 1.7           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 5.5           |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.011         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 533           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 4             |   |   | T   |
|           | Fluoride               | 0.25          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50          | U |   | ACR |
|           | Sulfate                | 30            |   |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 7.1           |   |   | E   |
|           | Specific Conductance   | 797           |   |   | E   |
|           | Total Dissolved Solids | 460           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121468

Matrix (Soil/Water): Water

Sample ID: Formation C

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 164           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.025         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 44.4          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 1.3           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 4.6           |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.023         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 617           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 8             |   |   | T   |
|           | Fluoride               | 0.26          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50          | U |   | ACR |
|           | Sulfate                | 30            |   |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 7.2           |   |   | E   |
|           | Specific Conductance   | 888           |   |   | E   |
|           | Total Dissolved Solids | 488           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121469

Matrix (Soil/Water): Water

Sample ID: Effluent A

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.08          | ✓ |   | F   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.019         | ✓ |   | F   |
| 7440-70-2 | Calcium                | 130           | ✓ |   | P   |
| 7440-47-3 | Chromium               | 0.011         | U |   | P   |
| 7440-50-8 | Copper                 | 0.007         | ✓ |   | F   |
| 7439-89-6 | Iron                   | 0.051         | ✓ |   | P   |
| 7439-92-1 | Lead                   | 0.001         | ✓ |   | F   |
| 7439-95-4 | Magnesium              | 61.4          | ✓ |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 7.3           | ✓ |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 105           | ✓ |   | P   |
| 7440-62-2 | Vanadium               | 0.12          | ✓ |   | F   |
| 7440-66-6 | Zinc                   | 0.025         | ✓ |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 551           | ✓ |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 159           | ✓ |   | T   |
|           | Fluoride               | 0.43          | ✓ |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.70          | ✓ |   | ACR |
|           | Sulfate                | 96            | ✓ |   | AM  |
|           | Total Phosphorus       | 1.06          | ✓ |   | MA  |
|           | pH                     | 8.0           | ✓ |   | E   |
|           | Specific Conductance   | 1,390         | ✓ |   | E   |
|           | Total Dissolved Solids | 814           | ✓ |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121470

Matrix (Soil/Water): Water

Sample ID: Effluent B

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.07 ✓        |   |   | F   |
| 7440-38-2 | Arsenic                | 0.002 ✓       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 ✓       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.009 ✓       |   |   | F   |
| 7440-70-2 | Calcium                | 138 ✓         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 ✓        | U |   | P   |
| 7440-50-8 | Copper                 | 0.008 ✓       |   |   | F   |
| 7439-89-6 | Iron                   | 0.046 ✓       |   |   | P   |
| 7439-92-1 | Lead                   | 0.001 ✓       |   |   | F   |
| 7439-95-4 | Magnesium              | 65.0 ✓        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 ✓       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02 ✓        | U |   | F   |
| 7440-09-7 | Potassium              | 7.8 ✓         |   |   | P   |
| 7782-49-2 | Selenium               | 0.003 ✓       | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 ✓        | U |   | F   |
| 7440-23-5 | Sodium                 | 113 ✓         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.12 ✓        |   |   | F   |
| 7440-66-6 | Zinc                   | 0.037 ✓       |   |   | P   |
|           | Ammonium               | 0.10 ✓        | U |   | AP  |
|           | Bicarbonate            | 533 ✓         |   |   | T   |
|           | Carbonate              | 0 ✓           |   |   | T   |
|           | Chloride               | 149 ✓         |   |   | T   |
|           | Fluoride               | 0.42 ✓        |   |   | ISE |
|           | Hydroxide              | 0 ✓           |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.80 ✓        |   |   | ACR |
|           | Sulfate                | 96 ✓          |   |   | AM  |
|           | Total Phosphorus       | 1.06 ✓        |   |   | MA  |
|           | pH                     | 8.0 ✓         |   |   | E   |
|           | Specific Conductance   | 1,430 ✓       |   |   | E   |
|           | Total Dissolved Solids | 788 ✓         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121471

Matrix (Soil/Water): Water

Sample ID: Effluent C

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10          |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.011         |   |   | P   |
| 7440-70-2 | Calcium                | 128           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.008         |   |   | F   |
| 7439-89-6 | Iron                   | 0.040         |   |   | P   |
| 7439-92-1 | Lead                   | 0.001         | X |   | F   |
| 7439-95-4 | Magnesium              | 60.3          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 7.3           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 104           |   |   | P   |
| 7440-62-2 | Vanadium               | 0.21          |   |   | F   |
| 7440-66-6 | Zinc                   | 0.031         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 533           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 153           |   |   | T   |
|           | Fluoride               | 0.40          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 4.55          |   |   | ACR |
|           | Sulfate                | 96            |   |   | AM  |
|           | Total Phosphorus       | 1.08          |   |   | MA  |
|           | pH                     | 8.0           |   |   | E   |
|           | Specific Conductance   | 1,430         |   |   | E   |
|           | Total Dissolved Solids | 786           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121472

Matrix (Soil/Water): Water

Sample ID: Down A

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.09          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 88.4          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.54          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 76.5          |   |   | P   |
| 7439-96-5 | Manganese              | 0.060         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 9.3           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 31.2          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.03          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.012         | U |   | P   |
|           | Ammonium               | 0.12          | U |   | AP  |
|           | Bicarbonate            | 611           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 29            |   |   | T   |
|           | Fluoride               | 0.31          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.16          |   |   | ACR |
|           | Sulfate                | 42            |   |   | AM  |
|           | Total Phosphorus       | 0.21          | U |   | MA  |
|           | pH                     | 7.1           |   |   | E   |
|           | Specific Conductance   | 1,020         |   |   | E   |
|           | Total Dissolved Solids | 556           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.Sample No. 121473Matrix (Soil/Water): WaterSample ID: Down BLevel (Low/Med): --Date Received: 10/29/91Solids: --Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.11          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 83.7          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.54          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         | U |   | F   |
| 7439-95-4 | Magnesium              | 75.0          |   |   | P   |
| 7439-96-5 | Manganese              | 0.063         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 9.6           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 29.9          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.03          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.015         | U |   | P   |
|           | Ammonium               | 0.12          |   |   | AP  |
|           | Bicarbonate            | 636           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 30            |   |   | T   |
|           | Fluoride               | 0.34          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.14          |   |   | ACR |
|           | Sulfate                | 42            |   |   | AM  |
|           | Total Phosphorus       | 0.24          | U |   | MA  |
|           | pH                     | 7.0           |   |   | E   |
|           | Specific Conductance   | 1,030         |   |   | E   |
|           | Total Dissolved Solids | 580           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121474

Matrix (Soil/Water): Water

Sample ID: Down C

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.11          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 86.2          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.59          | U |   | P   |
| 7439-92-1 | Lead                   | 0.002         |   |   | F   |
| 7439-95-4 | Magnesium              | 78.7          |   |   | P   |
| 7439-96-5 | Manganese              | 0.063         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 10.0          |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 31.1          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.03          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.008         | U |   | P   |
|           | Ammonium               | 0.43          | U |   | AP  |
|           | Bicarbonate            | 575           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 25            |   |   | T   |
|           | Fluoride               | 0.34          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.14          |   |   | ACR |
|           | Sulfate                | 42            |   |   | AM  |
|           | Total Phosphorus       | 0.22          | U |   | MA  |
|           | pH                     | 7.0           |   |   | E   |
|           | Specific Conductance   | 1.020         |   |   | E   |
|           | Total Dissolved Solids | 546           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121475

Matrix (Soil/Water): Water

Sample ID: Up Near

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.09          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 84.6          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.93          |   |   | P   |
| 7439-92-1 | Lead                   | 0.001         | U |   | F   |
| 7439-95-4 | Magnesium              | 84.1          |   |   | P   |
| 7439-96-5 | Manganese              | 0.083         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 10.4          |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 22.0          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.014         | U |   | P   |
|           | Ammonium               | 0.13          | U |   | AP  |
|           | Bicarbonate            | 648           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 15            |   |   | T   |
|           | Fluoride               | 0.31          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.65          |   |   | ACR |
|           | Sulfate                | 36            |   |   | AM  |
|           | Total Phosphorus       | 0.13          | U |   | MA  |
|           | pH                     | 6.8           |   |   | E   |
|           | Specific Conductance   | 990           |   |   | E   |
|           | Total Dissolved Solids | 546           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121476

Matrix (Soil/Water): Water

Sample ID: Up Middle

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.11          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 79.8          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.47          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 78.4          |   |   | P   |
| 7439-96-5 | Manganese              | 0.062         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 9.9           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 21.2          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.010         | U |   | P   |
|           | Ammonium               | 0.37          | U |   | AP  |
|           | Bicarbonate            | 611           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 15            |   |   | T   |
|           | Fluoride               | 0.31          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.74          |   |   | ACR |
|           | Sulfate                | 30            |   |   | AM  |
|           | Total Phosphorus       | 0.13          | U |   | MA  |
|           | pH                     | 7.1           |   |   | E   |
|           | Specific Conductance   | 950           |   |   | E   |
|           | Total Dissolved Solids | 498           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121477

Matrix (Soil/Water): Water

Sample ID: Up Far

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.07          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 77.6          |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.43          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         | U |   | F   |
| 7439-95-4 | Magnesium              | 75.5          |   |   | P   |
| 7439-96-5 | Manganese              | 0.058         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 9.3           |   |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 20.7          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.009         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 617           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 13            |   |   | T   |
|           | Fluoride               | 0.31          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.73          |   |   | ACR |
|           | Sulfate                | 36            |   |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 7.1           |   |   | E   |
|           | Specific Conductance   | 933           |   |   | E   |
|           | Total Dissolved Solids | 502           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121478

Matrix (Soil/Water): Water

Sample ID: Doc

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.08                   | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002                  | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001                  | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005                  | U |   | F   |
| 7440-70-2 | Calcium                | 116                    |   |   | P   |
| 7440-17-3 | Chromium               | 0.01                   | U |   | P   |
| 7440-50-8 | Copper                 | 0.005                  | U |   | F   |
| 7439-89-6 | Iron                   | 8.34                   |   |   | P   |
| 7439-92-1 | Lead                   | 0.001                  | U |   | F   |
| 7439-95-4 | Magnesium              | 133                    |   |   | P   |
| 7439-96-5 | Manganese              | 0.298                  |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02                   | U |   | F   |
| 7440-09-7 | Potassium              | 14.1                   |   |   | P   |
| 7782-49-2 | Selenium               | <del>0.005</del> 0.002 | U |   | H   |
| 7440-22-4 | Silver                 | 0.01                   | U |   | F   |
| 7440-23-5 | Sodium                 | 34.2                   |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02                   | U |   | F   |
| 7440-66-6 | Zinc                   | 0.009                  | U |   | P   |
|           | Ammonium               | 0.60                   | U |   | AP  |
|           | Bicarbonate            | 496                    |   |   | T   |
|           | Carbonate              | 0                      |   |   | T   |
|           | Chloride               | 14                     |   |   | T   |
|           | Fluoride               | 0.38                   |   |   | ISE |
|           | Hydroxide              | 0                      |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50                   | U |   | ACR |
|           | Sulfate                | 30                     |   |   | AM  |
|           | Total Phosphorus       | 0.37                   | U |   | MA  |
|           | pH                     | 6.0                    |   |   | E   |
|           | Specific Conductance   | 1510                   |   |   | E   |
|           | Total Dissolved Solids | 812                    |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121479

Matrix (Soil/Water): Water

Sample ID: TW-32-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 2.9           | U |   | P   |
| 7440-38-2 | Total Arsenic          | 0.002         | U |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001         | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.005         | U |   | F   |
| 7440-70-2 | Total Calcium          | 129           |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.04          |   |   | P   |
| 7440-50-8 | Total Copper           | 0.007         | U |   | F   |
| 7439-89-6 | Total Iron             | 2.2           |   |   | P   |
| 7439-92-1 | Total Lead             | 0.003         |   |   | F   |
| 7439-95-4 | Total Magnesium        | 49.0          |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.085         |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.02          | U |   | F   |
| 7440-09-7 | Total Potassium        | 8.3           |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.003, 0.002  | U |   | H   |
| 7440-22-4 | Total Silver           | 0.01          | U |   | F   |
| 7440-23-5 | Total Sodium           | 89.3          |   |   | P   |
| 7440-62-2 | Total Vanadium         | 4.69          |   |   | F   |
| 7440-66-6 | Total Zinc             | 0.008         | U |   | P   |
|           | Ammonium               | 5.7           |   |   | AP  |
|           | Bicarbonate            | 987           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 108           |   |   | T   |
|           | Fluoride               | 0.25          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 7.00          |   |   | ACR |
|           | Sulfate                | 108           |   |   | AM  |
|           | Total Phosphorus       | 1.06          |   |   | MA  |
|           | pH                     | 7.1           |   |   | E   |
|           | Specific Conductance   | 1.250         |   |   | E   |
|           | Total Dissolved Solids | 676           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121479

Matrix (Soil/Water): Water

Sample ID: TW-32-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION          | C | Q | M |
|-----------|---------------------|------------------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.10                   | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.004                  |   |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001                  | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 0.005                  | U |   | F |
| 7440-70-2 | Dissolved Calcium   | 128                    |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.02                   |   |   | P |
| 7440-50-8 | Dissolved Copper    | 0.005                  | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.032                  | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001                  | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 48.5                   |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.007                  | U |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.02                   | U |   | F |
| 7440-09-7 | Dissolved Potassium | 7.0                    |   |   | P |
| 7782-49-2 | Dissolved Selenium  | <del>0.003</del> 0.002 | U |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01                   | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 93.4                   |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 5.52                   |   |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.008                  | U |   | P |
|           |                     |                        |   |   |   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.Sample No. 121480Matrix (Soil/Water): WaterSample ID: TW-36-RFKLevel (Low/Med): --Date Received: 10/29/91Solids: --Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION        | C | Q | M   |
|-----------|------------------------|----------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10 <u>—</u>        | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002 <u>—</u>       | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001 <u>—</u>       | U |   | F   |
| 7440-43-9 | Cadmium                | 0.056 <u>—</u>       |   |   | F   |
| 7440-70-2 | Calcium                | 104 <u>—</u>         |   |   | P   |
| 7440-47-3 | Chromium               | 0.01 <u>—</u>        |   |   | P   |
| 7440-50-8 | Copper                 | 0.007 <u>—</u>       | U |   | F   |
| 7439-89-6 | Iron                   | 0.069 <u>—</u>       | U |   | P   |
| 7439-92-1 | Lead                   | 0.002 <u>—</u>       | / |   | F   |
| 7439-95-4 | Magnesium              | 87.1 <u>—</u>        |   |   | P   |
| 7439-96-5 | Manganese              | 0.005 <u>—</u>       | U |   | P   |
| 7440-02-0 | Nickel                 | 0.03 <u>—</u>        |   |   | F   |
| 7440-09-7 | Potassium              | 15.5 <u>—</u>        |   |   | P   |
| 7782-49-2 | Selenium               | 0.085, 0.02 <u>—</u> | U |   | H   |
| 7440-22-4 | Silver                 | 0.01 <u>—</u>        | U |   | F   |
| 7440-23-5 | Sodium                 | 177 <u>—</u>         |   |   | P   |
| 7440-62-2 | Vanadium               | 0.05 <u>—</u>        | U |   | F   |
| 7440-66-6 | Zinc                   | 0.441 <u>—</u>       |   |   | P   |
|           | Ammonium               | 0.10 <u>—</u>        | U |   | AP  |
|           | Bicarbonate            | 424 <u>—</u>         |   |   | T   |
|           | Carbonate              | 0 <u>—</u>           |   |   | T   |
|           | Chloride               | 342 <u>—</u>         |   |   | T   |
|           | Fluoride               | 5.00 <u>—</u>        |   |   | ISE |
|           | Hydroxide              | 0 <u>—</u>           |   |   | T   |
|           | Nitrate/Nitrite as N   | 3.95 <u>—</u>        |   |   | ACR |
|           | Sulfate                | 78 <u>—</u>          |   |   | AM  |
|           | Total Phosphorus       | 0.40 <u>—</u>        | U |   | MA  |
|           | pH                     | 6.8 <u>—</u>         | / |   | E   |
|           | Specific Conductance   | 1,830 <u>—</u>       |   |   | E   |
|           | Total Dissolved Solids | 964 <u>—</u>         |   |   | G   |
|           | Turbidity              | Not required         |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121481

Matrix (Soil/Water): Water

Sample ID: EB Beaker

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06          |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 0.5           | U |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.060         |   |   | P   |
| 7439-92-1 | Lead                   | 0.002         |   |   | F   |
| 7439-95-4 | Magnesium              | 0.5           | U |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 0.4           | U |   | P   |
| 7782-49-2 | Selenium               | 0.003 - 0.002 | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 0.04          | U |   | P   |
| 7440-62-2 | Vanadium               | 0.02          |   |   | F   |
| 7440-66-6 | Zinc                   | 0.008         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 0.4           | U |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 0.10          | U |   | T   |
|           | Fluoride               | 0.10 - 0.02   | U |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50          | U |   | ACR |
|           | Sulfate                | 1             | U |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 6.0           |   |   | E   |
|           | Specific Conductance   | 11            |   |   | E   |
|           | Total Dissolved Solids | 10            | U |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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Klorie  
2/10/91

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121482

Matrix (Soil/Water): Water

Sample ID: EB Filter

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION          | C | Q | M   |
|-----------|------------------------|------------------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.07                   |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002                  | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001                  | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005                  | U |   | F   |
| 7440-70-2 | Calcium                | 0.5                    | U |   | P   |
| 7440-47-3 | Chromium               | 0.01                   | U |   | P   |
| 7440-50-8 | Copper                 | 0.005                  | U |   | F   |
| 7439-89-6 | Iron                   | 0.025                  | U |   | P   |
| 7439-92-1 | Lead                   | 0.002                  |   |   | F   |
| 7439-95-4 | Magnesium              | 0.5                    | U |   | P   |
| 7439-96-5 | Manganese              | 0.005                  | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02                   | U |   | F   |
| 7440-09-7 | Potassium              | 0.4                    | U |   | P   |
| 7782-49-2 | Selenium               | 0.003, 0.002           | U |   | H   |
| 7440-22-4 | Silver                 | 0.01                   | U |   | F   |
| 7440-23-5 | Sodium                 | 0.04                   | U |   | P   |
| 7440-62-2 | Vanadium               | 0.04                   |   |   | F   |
| 7440-66-6 | Zinc                   | 0.008                  | U |   | P   |
|           | Ammonium               | Analysis not requested |   |   | AP  |
|           | Bicarbonate            | Analysis not requested |   |   | T   |
|           | Carbonate              | Analysis not requested |   |   | T   |
|           | Chloride               | Analysis not requested |   |   | T   |
|           | Fluoride               | Analysis not requested |   |   | ISE |
|           | Hydroxide              | Analysis not requested |   |   | T   |
|           | Nitrate/Nitrite as N   | Analysis not requested |   |   | ACR |
|           | Sulfate                | Analysis not requested |   |   | AM  |
|           | Total Phosphorus       | Analysis not requested |   |   | MA  |
|           | pH                     | Analysis not requested |   |   | E   |
|           | Specific Conductance   | Analysis not requested |   |   | E   |
|           | Total Dissolved Solids | Analysis not requested |   |   | G   |
|           | Turbidity              | Not required           |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121483

Matrix (Soil/Water): Water

Sample ID: TW-11-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.12          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 173           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.075         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 69.7          |   |   | P   |
| 7439-96-5 | Manganese              | 0.008         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 7.2           |   |   | P   |
| 7782-49-2 | Selenium               | 0.005, 0.002  | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 145           |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.013         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 496           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 183           |   |   | T   |
|           | Fluoride               | 0.21          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 5.45          |   |   | ACR |
|           | Sulfate                | 320           |   |   | AM  |
|           | Total Phosphorus       | 0.11          | U |   | MA  |
|           | pH                     | 6.9           |   |   | E   |
|           | Specific Conductance   | 1,870         |   |   | E   |
|           | Total Dissolved Solids | 1.152         |   |   | G   |
|           | Turbidity              | Not requested |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121484

Matrix (Soil/Water): Water

Sample ID: TW-20-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.10          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.019         |   |   | F   |
| 7440-70-2 | Calcium                | 184           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.007         | U |   | F   |
| 7439-89-6 | Iron                   | 0.13          | U |   | P   |
| 7439-92-1 | Lead                   | 0.003         |   |   | F   |
| 7439-95-4 | Magnesium              | 106           |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          |   |   | F   |
| 7440-09-7 | Potassium              | 30.8          |   |   | P   |
| 7782-49-2 | Selenium               | 0.011         |   |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 91.9          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.268         |   |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 394           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 176           |   |   | T   |
|           | Fluoride               | 6.97          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 7.55          |   |   | ACR |
|           | Sulfate                | 500           |   |   | AM  |
|           | Total Phosphorus       | 0.40          | U |   | MA  |
|           | pH                     | 6.9           |   |   | E   |
|           | Specific Conductance   | 1,990         |   |   | E   |
|           | Total Dissolved Solids | 1,298         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121485

Matrix (Soil/Water): Water

Sample ID: TW-40-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 0.51          | U |   | P   |
| 7440-38-2 | Total Arsenic          | 0.002         |   |   | H   |
| 7440-41-7 | Total Beryllium        | 0.002         |   |   | F   |
| 7440-43-9 | Total Cadmium          | 7.07          |   |   | F   |
| 7440-70-2 | Total Calcium          | 375           |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.02          |   |   | P   |
| 7440-50-8 | Total Copper           | 0.012         | U |   | F   |
| 7439-89-6 | Total Iron             | 0.74          | U |   | P   |
| 7439-92-1 | Total Lead             | 0.002         |   |   | F   |
| 7439-95-4 | Total Magnesium        | 170           |   |   | P   |
| 7439-96-5 | Total Manganese        | 1.04          |   |   | P   |
| 7440-02-0 | Total Nickel           | 0.15          |   |   | F   |
| 7440-09-7 | Total Potassium        | 86.5          |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.290         |   |   | H   |
| 7440-22-4 | Total Silver           | 0.01          | U |   | F   |
| 7440-23-5 | Total Sodium           | 210           |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.06          | U |   | F   |
| 7440-66-6 | Total Zinc             | 11.6          |   |   | P   |
|           | Ammonium               | 0.21          | U |   | AP  |
|           | Bicarbonate            | 327           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 679           |   |   | T   |
|           | Fluoride               | 7.89          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 35.2          |   |   | ACR |
|           | Sulfate                | 680           |   |   | AM  |
|           | Total Phosphorus       | 1.68          |   |   | MA  |
|           | pH                     | 6.5           |   |   | E   |
|           | Specific Conductance   | 3,940         |   |   | E   |
|           | Total Dissolved Solids | 2,668         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121485

Matrix (Soil/Water): Water

Sample ID: TW-40-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.30          | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.002         |   |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001         | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 5.95          |   |   | F |
| 7440-70-2 | Dissolved Calcium   | 372           |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01          | U |   | P |
| 7440-50-8 | Dissolved Copper    | 0.008         | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.030         | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001         | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 184           |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.982         |   |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.13          |   |   | F |
| 7440-09-7 | Dissolved Potassium | 95            |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.289         |   |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01          | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 216           |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.08          | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 9.30          |   |   | P |
|           |                     |               |   |   |   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121486

Matrix (Soil/Water): Water

Sample ID: TW-42-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 0.37          | U |   | P   |
| 7440-38-2 | Total Arsenic          | 0.011         |   |   | H   |
| 7440-41-7 | Total Beryllium        | 0.001         | U |   | F   |
| 7440-43-9 | Total Cadmium          | 0.112         |   |   | P   |
| 7440-70-2 | Total Calcium          | 190           |   |   | P   |
| 7440-47-3 | Total Chromium         | 0.01          | U |   | P   |
| 7440-50-8 | Total Copper           | 0.005         | U |   | F   |
| 7439-89-6 | Total Iron             | 0.40          | U |   | P   |
| 7439-92-1 | Total Lead             | 0.002         |   |   | F   |
| 7439-95-4 | Total Magnesium        | 106           |   |   | P   |
| 7439-96-5 | Total Manganese        | 0.041         | U |   | P   |
| 7440-02-0 | Total Nickel           | 0.02          |   |   | F   |
| 7440-09-7 | Total Potassium        | 40.8          |   |   | P   |
| 7782-49-2 | Total Selenium         | 0.098         |   |   | H   |
| 7440-22-4 | Total Silver           | 0.01          | U |   | F   |
| 7440-23-5 | Total Sodium           | 126           |   |   | P   |
| 7440-62-2 | Total Vanadium         | 0.03          | U |   | F   |
| 7440-66-6 | Total Zinc             | 0.448         |   |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 508           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 229           |   |   | T   |
|           | Fluoride               | 4.4           |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 12.2          |   |   | ACR |
|           | Sulfate                | 320           |   |   | AM  |
|           | Total Phosphorus       | 3.72          |   |   | MA  |
|           | pH                     | 6.8           |   |   | E   |
|           | Specific Conductance   | 2.070         |   |   | E   |
|           | Total Dissolved Solids | 1.280         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121486

Matrix (Soil/Water): Water

Sample ID: TW-42-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.12          | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.009         |   |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001         | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 0.079         |   |   | F |
| 7440-70-2 | Dissolved Calcium   | 186           |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01          | U |   | P |
| 7440-50-8 | Dissolved Copper    | 0.005         | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.031         | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001         | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 100           |   |   | P |
| 7439-96-5 | Dissolved Manganese | 0.030         | U |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.02          |   |   | F |
| 7440-09-7 | Dissolved Potassium | 41            |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.090         |   |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01          | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 110           |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.05          | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 0.31          |   |   | P |
|           |                     |               |   |   |   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121487

Matrix (Soil/Water): Water

Sample ID: FB-06-RFK

Level (Low/Med): --

Date Received: 10/29/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.05          |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | P   |
| 7440-70-2 | Calcium                | 0.5           | U |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.025         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 0.5           | U |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 0.4           | U |   | P   |
| 7782-49-2 | Selenium               | 0.003         | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 0.09          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.01          |   |   | F   |
| 7440-66-6 | Zinc                   | 0.013         |   |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 0.4           | U |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 0.10          | U |   | T   |
|           | Fluoride               | 0.10          | U |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50          | U |   | ACR |
|           | Sulfate                | 1             | U |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 5.4           |   |   | E   |
|           | Specific Conductance   | 12            |   |   | E   |
|           | Total Dissolved Solids | 11            |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.Sample No. 121512Matrix (Soil/Water): WaterSample ID: TW-43-CCYLevel (Low/Med): --Date Received: 10/30/91Solids: --Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Total Aluminum         | 36.6          | ✓ |   | P   |
| 7440-38-2 | Total Arsenic          | 0.30          | ✓ |   | H   |
| 7440-41-7 | Total Beryllium        | 0.003         | ✓ |   | F   |
| 7440-43-9 | Total Cadmium          | 11.2          | ✓ |   | P   |
| 7440-70-2 | Total Calcium          | 580           | ✓ |   | P   |
| 7440-47-3 | Total Chromium         | 0.57          | ✓ |   | P   |
| 7440-50-8 | Total Copper           | 0.18          | ✓ |   | F   |
| 7439-89-6 | Total Iron             | 32.9          | ✓ |   | P   |
| 7439-92-1 | Total Lead             | 0.164         | ✓ | ✓ | F   |
| 7439-95-4 | Total Magnesium        | 137           | ✓ |   | P   |
| 7439-96-5 | Total Manganese        | 1.69          | ✓ |   | P   |
| 7440-02-0 | Total Nickel           | 0.59          | ✓ |   | F   |
| 7440-09-7 | Total Potassium        | 132           | ✓ |   | P   |
| 7782-49-2 | Total Selenium         | 0.96          | ✓ |   | H   |
| 7440-22-4 | Total Silver           | 0.03          | ✓ | U | F   |
| 7440-23-5 | Total Sodium           | 268           | ✓ |   | P   |
| 7440-62-2 | Total Vanadium         | 1.40          | ✓ |   | F   |
| 7440-66-6 | Total Zinc             | 32.6          |   |   | P   |
|           | Ammonium               | 0.34          | ✓ | U | AP  |
|           | Bicarbonate            | 339           | ✓ |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 571           | ✓ |   | T   |
|           | Fluoride               | 11            | ✓ |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 26.0          | ✓ |   | ACR |
|           | Sulfate                | 700           | ✓ |   | AM  |
|           | Total Phosphorus       | 2.12          | ✓ |   | MA  |
|           | pH                     | 6.6           | ✓ | ✓ | E   |
|           | Specific Conductance   | 3.540         | ✓ |   | E   |
|           | Total Dissolved Solids | 2.330         | ✓ |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121512

Matrix (Soil/Water): Water

Sample ID: TW-43-CCY

Level (Low/Med): --

Date Received: 10/30/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE             | CONCENTRATION | C | Q | M |
|-----------|---------------------|---------------|---|---|---|
| 7429-90-5 | Dissolved Aluminum  | 0.15          | U |   | P |
| 7440-38-2 | Dissolved Arsenic   | 0.010         |   |   | H |
| 7440-41-7 | Dissolved Beryllium | 0.001         | U |   | F |
| 7440-43-9 | Dissolved Cadmium   | 8.00          |   |   | P |
| 7440-70-2 | Dissolved Calcium   | 360           |   |   | P |
| 7440-47-3 | Dissolved Chromium  | 0.01          | U |   | P |
| 7440-50-8 | Dissolved Copper    | 0.005         | U |   | F |
| 7439-89-6 | Dissolved Iron      | 0.035         | U |   | P |
| 7439-92-1 | Dissolved Lead      | 0.001         | U |   | F |
| 7439-95-4 | Dissolved Magnesium | 143           |   |   | P |
| 7439-96-5 | Dissolved Manganese | 1.33          |   |   | P |
| 7440-02-0 | Dissolved Nickel    | 0.14          |   |   | F |
| 7440-09-7 | Dissolved Potassium | 124           |   |   | P |
| 7782-49-2 | Dissolved Selenium  | 0.22          |   |   | H |
| 7440-22-4 | Dissolved Silver    | 0.01          | U |   | F |
| 7440-23-5 | Dissolved Sodium    | 275           |   |   | P |
| 7440-62-2 | Dissolved Vanadium  | 0.17          | U |   | F |
| 7440-66-6 | Dissolved Zinc      | 14.1          |   |   | P |
|           |                     |               |   |   |   |

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## INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.Sample No. 121513Matrix (Soil/Water): WaterSample ID: Kelly ALevel (Low/Med): --Date Received: 10/30/91Solids: --Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.08          | U |   | F   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 114           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.028         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 51.0          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 4.0           |   |   | P   |
| 7782-49-2 | Selenium               | 0.005, 0.002  | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 20.5          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.03          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.014         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 484           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 46            |   |   | T   |
|           | Fluoride               | 0.29          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.10          |   |   | ACR |
|           | Sulfate                | 36            |   |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 7.9           |   |   | E   |
|           | Specific Conductance   | 854           |   |   | E   |
|           | Total Dissolved Solids | 522           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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4/16/92

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2/10/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121514

Matrix (Soil/Water): Water

Sample ID: Kelly B

Level (Low/Med): --

Date Received: 10/30/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06          | U |   | F   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 114           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.028         | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 49.9          |   |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 4.2           |   |   | P   |
| 7782-49-2 | Selenium               | 0.005, 0.02   | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 20.8          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.02          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.014         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 484           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 55            |   |   | T   |
|           | Fluoride               | 0.30          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 1.09          |   |   | ACR |
|           | Sulfate                | 42            |   |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 7.9           |   |   | E   |
|           | Specific Conductance   | 814           |   |   | E   |
|           | Total Dissolved Solids | 500           |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121515

Matrix (Soil/Water): Water

Sample ID: TW-41-RFK

Level (Low/Med): --

Date Received: 10/30/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.21          | U |   | P   |
| 7440-38-2 | Arsenic                | 0.012         |   |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 148           |   |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.008         | U |   | F   |
| 7439-89-6 | Iron                   | 0.16          | U |   | P   |
| 7439-92-1 | Lead                   | 0.001         |   |   | F   |
| 7439-95-4 | Magnesium              | 84.6          |   |   | P   |
| 7439-96-5 | Manganese              | 0.418         |   |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 41            |   |   | P   |
| 7782-49-2 | Selenium               | 0.105         |   |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 96.8          |   |   | P   |
| 7440-62-2 | Vanadium               | 0.03          | U |   | F   |
| 7440-66-6 | Zinc                   | 0.019         | U |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 545           |   |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 139           |   |   | T   |
|           | Fluoride               | 4.80          |   |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 11.0          |   |   | ACR |
|           | Sulfate                | 234           |   |   | AM  |
|           | Total Phosphorus       | 2.20          |   |   | MA  |
|           | pH                     | 6.6           |   |   | E   |
|           | Specific Conductance   | 1,730         |   |   | E   |
|           | Total Dissolved Solids | 1,052         |   |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121588

Matrix (Soil/Water): Water

Sample ID: EB Spoon

Level (Low/Med): --

Date Received: 11/01/91

Solids: --

Concentration Units (mg/l or mg/kg dry weight): mg/l

| CAS NO.   | ANALYTE                | CONCENTRATION | C | Q | M   |
|-----------|------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum               | 0.06          |   |   | P   |
| 7440-38-2 | Arsenic                | 0.002         | U |   | H   |
| 7440-41-7 | Beryllium              | 0.001         | U |   | F   |
| 7440-43-9 | Cadmium                | 0.005         | U |   | F   |
| 7440-70-2 | Calcium                | 0.5           | U |   | P   |
| 7440-47-3 | Chromium               | 0.01          | U |   | P   |
| 7440-50-8 | Copper                 | 0.005         | U |   | F   |
| 7439-89-6 | Iron                   | 0.025         | U |   | P   |
| 7439-92-1 | Lead                   | 0.003         |   |   | F   |
| 7439-95-4 | Magnesium              | 0.5           | U |   | P   |
| 7439-96-5 | Manganese              | 0.005         | U |   | P   |
| 7440-02-0 | Nickel                 | 0.02          | U |   | F   |
| 7440-09-7 | Potassium              | 0.4           | U |   | P   |
| 7782-49-2 | Selenium               | 0.003, 0.02   | U |   | H   |
| 7440-22-4 | Silver                 | 0.01          | U |   | F   |
| 7440-23-5 | Sodium                 | 0.04          | U |   | P   |
| 7440-62-2 | Vanadium               | 0.02          |   |   | F   |
| 7440-66-6 | Zinc                   | 0.012         |   |   | P   |
|           | Ammonium               | 0.10          | U |   | AP  |
|           | Bicarbonate            | 0.4           | U |   | T   |
|           | Carbonate              | 0             |   |   | T   |
|           | Chloride               | 0.10          | U |   | T   |
|           | Fluoride               | 0.02, 0.10    | U |   | ISE |
|           | Hydroxide              | 0             |   |   | T   |
|           | Nitrate/Nitrite as N   | 0.50          | U |   | ACR |
|           | Sulfate                | 1             | U |   | AM  |
|           | Total Phosphorus       | 0.10          | U |   | MA  |
|           | pH                     | 5.5           |   |   | E   |
|           | Specific Conductance   | 10            | U |   | E   |
|           | Total Dissolved Solids | 10            | U |   | G   |
|           | Turbidity              | Not required  |   |   | N   |

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4/16/92

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2/10/92

**APPENDIX S**

**ATTACHMENT 2**

**RADIOCHEMICAL DATA ASSESSMENT SUMMARIES - WATER SAMPLES**

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Monsanto  
 LABORATORY ALR SAMPLES/MATRIX Water

SDG # 40420-21  
1 edge C, Form C, EHA, EHB  
EHC, Down A, B, C, Upstream,  
middle, far, TW-32, TW-36

DATA ASSESSMENT SUMMARY EB-beaker, EB-Filter  
TW-11, TW-20, TW-40,  
TW-42  
FB-06

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>Down</u>    | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     |                | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     |                | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: Alpha/Beta recounted 2/2/92  
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 \_\_\_\_\_  
 \_\_\_\_\_  
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 \_\_\_\_\_  
 \_\_\_\_\_

Validated by: Kenneth L. Miller Date: 2/15/92  
 Reviewed by: Paul Duglas Date: 2/21/92

**A N A L Y S I S   R E P O R T**

DATE: 01/27/92      PAGE 3  
Lab Job Number 8734-40420-21

These samples to be disposed of 30 days after the date of this report.

|                       |                 |                  |                  |                  |
|-----------------------|-----------------|------------------|------------------|------------------|
| ALR Designation -     | 8734-40420-21-9 | 8734-40420-21-10 | 8734-40420-21-11 | 8734-40420-21-12 |
| Sponsor Designation - | UP-NEAR         | UP-MIDDLE        | UP-FAR           | DOC              |
| Date Collected -      | 10/25/91        | 10/25/91         | 10/25/91         | 10/25/91         |

Determinations in pCi/L unless noted

|                           |                     |                      |                     |                      |
|---------------------------|---------------------|----------------------|---------------------|----------------------|
| Gross Alpha - total       | $6 \pm 5^*$         | $6 \pm 5^*$          | $0 \pm 4^*$         | $0 \pm 1^*$          |
| Radium-226 - total        | $0.0 \pm 0.3^* \mu$ | $-0.2 \pm 0.3^* \mu$ | $0.1 \pm 0.4^* \mu$ | $-0.1 \pm 0.3^* \mu$ |
| Radium-228 - total        | $0.0 \pm 0.6^* \mu$ | $-0.1 \pm 0.6^* \mu$ | $0.3 \pm 0.6^* \mu$ | $0.3 \pm 0.6^* \mu$  |
| Radon-222 - total         | $51 \pm 39^*$       | $0 \pm 37^* \mu$     | $19 \pm 39^* \mu$   | $62 \pm 40^*$        |
| Uranium - total<br>(mg/L) | <0.002              | <0.002               | <0.002              | <0.002               |

*2/21/92*  
*K. L. L. L.*  
*2/5/92*

**A N A L Y S I S   R E P O R T**

DATE: 01/27/92      PAGE 4

Lab Job Number 8734-40420-21

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -     | 8734-40420-21-13 | 8734-40420-21-14 | 8734-40420-21-15 | 8734-40420-21-16 |
|-----------------------|------------------|------------------|------------------|------------------|
| Sponsor Designation - | TW-32-RFK        | TW-36-RFK        | EB-BEAKER        | EB-FILTER        |
| Date Collected -      | 10/26/91         | 10/26/91         | 10/26/91         | 10/27/91         |

Determinations in pCi/L unless noted

|                               |                      |                       |                      |                       |
|-------------------------------|----------------------|-----------------------|----------------------|-----------------------|
| Gross Alpha - dissolved       | 0 ± 6 *              | ----                  | ----                 | ----                  |
| Gross Alpha - total           | 4 ± 7 *              | 2 ± 8 *               | 1 ± 1 *              | 2 ± 1 *               |
| Radium-226 - dissolved        | 0.2 ± 0.3 * <i>U</i> | ----                  | ----                 | ----                  |
| Radium-226 - total            | 0.1 ± 0.3 * <i>U</i> | 0.1 ± 0.3 * <i>U</i>  | 0.0 ± 0.4 * <i>U</i> | -0.2 ± 0.4 * <i>U</i> |
| Radium-228 - dissolved        | 0.2 ± 0.8 * <i>U</i> | ----                  | ----                 | ----                  |
| Radium-228 - total            | 0.5 ± 0.7 *          | -0.3 ± 0.5 * <i>U</i> | 0.3 ± 0.5 * <i>U</i> | 0.6 ± 0.5 *           |
| Radium-222 - total            | 420 ± 50 *           | 96 ± 37 *             | -20 ± 33 * <i>U</i>  | ----                  |
| Uranium - dissolved<br>(mg/L) | <0.002               | ----                  | ----                 | ----                  |
| Uranium - total<br>(mg/L)     | 0.004                | <0.002                | <0.002               | <0.002                |

*1/24/92*  
*2/21/92*

*Klome*  
*2/5/92*

**A N A L Y S I S   R E P O R T**  
**DATE: 01/27/92      PAGE 5**  
**Lab Job Number 8734-40420-21**

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -                    | 8734-40420-21-17     | 8734-40420-21-18      | 8734-40420-21-19     | 8734-40420-21-20     |
|--------------------------------------|----------------------|-----------------------|----------------------|----------------------|
| Sponsor Designation -                | TW-11-RFK            | TW-20-RFK             | TW-40-RFK            | TW-42-RFK            |
| Date Collected -                     | 10/27/91             | 10/27/91              | 10/27/91             | 10/27/91             |
| Determinations in pCi/L unless noted |                      |                       |                      |                      |
| Gross Alpha - dissolved              | ----                 | ----                  | -3 ± 15 *            | 2 ± 10 *             |
| Gross Alpha - total                  | 6 ± 10 *             | 3 ± 9 *               | 5 ± 18 *             | 1 ± 9 *              |
| Radium-226 - dissolved               | ----                 | ----                  | 0.7 ± 0.3 * <i>u</i> | 0.8 ± 0.3 * <i>u</i> |
| Radium-226 - total                   | 0.2 ± 0.3 * <i>u</i> | -0.1 ± 0.3 * <i>u</i> | 0.1 ± 0.3 * <i>u</i> | 0.2 ± 0.3 * <i>u</i> |
| Radium-228 - dissolved               | ----                 | ----                  | 0.5 ± 0.7 *          | 0.0 ± 0.8 * <i>u</i> |
| Radium-228 - total                   | 0.2 ± 0.5 * <i>u</i> | 0.3 ± 0.6 * <i>u</i>  | 0.5 ± 0.5 *          | 0.2 ± 0.6 * <i>u</i> |
| Radon-222 - total                    | 790 ± 50 *           | 40 ± 30 *             | 160 ± 30 *           | 120 ± 30 *           |
| Uranium - dissolved<br>(mg/L)        | ----                 | ----                  | 0.002                | <0.002               |
| Uranium - total<br>(mg/L)            | <0.002               | 0.003                 | 0.009                | <0.002               |

*Klowi  
2/5/92*

A N A L Y S I S   R E P O R T

DATE: 01/27/92      PAGE 6

Lab Job Number 8734-40420-21

These samples to be disposed of 30 days after the date of this report.

ALR Designation -            8734-40420-21-21

Sponsor Designation -      FB-06-RFK

Date Collected -          10/27/91

Determinations in pCi/L unless noted

|                           |                    |
|---------------------------|--------------------|
| Gross Alpha - total       | $0 \pm 1$ *        |
| Radium-226 - total        | $-0.1 \pm 0.5$ * U |
| Radium-228 - total        | $-0.1 \pm 0.5$ * U |
| Radon-222 - total         | $21 \pm 30$ * U    |
| Uranium - total<br>(mg/L) | $<0.002$           |

*2/21/92*

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By:

*Bud Summers*  
Bud Summers  
Radiochemistry Supervisor

BS/ep  
*4*

*Klow  
2/5/92*

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Mt Santo  
 LABORATORY ALR SAMPLES/MATRIX Water  
 SDG # 40296-6 TW-28, TW-29, TW-9,  
TW-27, FB-03, TW-34

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: \_\_\_\_\_

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Validated by: Kenny Louie Date: 2/9/92  
 Reviewed by: W. H. Hughes Date: 2/21/92

SDG #

Project No.

**YES**

NC

## 1. Holding Times

acceptable holding time

## 2. Calibrations

Verify from raw data for std

### 3. Blanks

Qualify Blanks with values less than 5x

#### 4. Laboratory Control Standard

verified CCS with in Central limits

Reval 9.12 Re 226  $2156/2350 \times 100 = 91.7\%$  89.7%

## 5. Duplicate Analysis

acceptable Data results<sup>2</sup>

## 6. Matrix Spike Analysis

N/A

## 7. Sample Results Verification

### Verified Sample Results for Transcription

E.C.R. 102, NO ERRORS made

SDG # 40296-6 Project No. 913-1101-211

Acceptable  
YES NO

8. Other QC .....                      

N/A.

9. Field Duplicates .....                      

N/A

10. Overall Assessment ..... X           

1 Tequality form 1's for Blanks



# Accu-Labs Research, Inc.

4663 Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 12/17/91 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40296-6  
Date Samples Received: 10/21/91  
Customer PO Number: PROJECT #913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -                    | 8734-40296-6-1 | 8734-40296-6-2 | 8734-40296-6-3 | 8734-40296-6-4 |
|--------------------------------------|----------------|----------------|----------------|----------------|
| Sponsor Designation -                | TW-28-RFK      | TW-29-RFK      | TW-9-RFK       | TW-21-RFK      |
| Date Collected -                     | 10/17/91       | 10/17/91       | 10/17/91       | 10/17/91       |
| Determinations in pCi/L unless noted |                |                |                |                |
|                                      | 5X Blank       |                |                |                |
| Gross Alpha - total                  | 1.2            | 4 ± 6 *        | -2 ± 5 *       | 1 ± 9 * U      |
| Radium-226 - total                   | 1.9            | -0.4 ± 0.6 * U | 0.0 ± 0.6 * U  | -0.5 ± 0.6 * U |
| Radium-228 - total                   | 1.0            | -0.1 ± 0.6 * U | -0.1 ± 0.5 * U | -0.3 ± 0.5 * U |
| Radon-222 - total                    | 16.7           | 280 ± 40 *     | 330 ± 40 *     | 0.0 ± 0.6 * U  |
| Uranium - total                      | ---            |                | 18 ± 33 *      | 120 ± 30 *     |
| (mg/L)                               |                | 0.002          | <0.002         | <0.002         |

| ALR Designation -     | 8734-40296-6-5 | 8734-40296-6-6 |
|-----------------------|----------------|----------------|
| Sponsor Designation - | FB-03-RFK      | TW-34-RFK      |
| Date Collected -      | 10/17/91       | 10/17/91       |

|                     |                |                |
|---------------------|----------------|----------------|
| Gross Alpha - total | 0 ± 1 * U      | 4 ± 6 *        |
| Radium-226 - total  | -0.2 ± 0.5 * U | -0.2 ± 0.6 * U |
| Radium-228 - total  | 0.3 ± 0.5 * U  | 0.5 ± 0.6 * U  |
| Radon-222 - total   | 51 ± 32 *      | 86 ± 33 *      |
| Uranium - total     |                |                |
| (mg/L)              | 0.002          | <0.002         |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By: Bud Summers  
Bud Summers  
Radiochemistry Supervisor

*Handwritten:* 2/21/92

*Handwritten:* Klov 2/4/92

BS/ep *Handwritten initials*

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101-211 SITE Monsanto  
 LABORATORY ALR SAMPLES/MATRIX Water  
Kelly A, Kelly B, AW-3, TW-41  
 SDG # 40442-S TW-43

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>Well</u>    | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: \_\_\_\_\_  
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 \_\_\_\_\_

Validated by: Kenny Louie Date: 2/5/92  
 Reviewed by: W. H. Hughes Date: 2/21/92

SDG # 4042-5 Project No. 913-1101.211

Acceptable  
YES NO

1. Holding Times ----- ☒ -----

holding time acceptable

2. Calibrations ----- ☒ -----

Verified std and blanks with True  
value verified reliability Average  
all raw data acceptable.

3. Blanks ----- ☒ -----

requantity sample results with  
"u" for value less than 5x the Blank  
value.

4. Laboratory Control Standard ----- ☒ -----

Verified Sample recovery within 80-120%  
Recal 226  $2350/2350 \times 100 = 107\%$

5. Duplicate Analysis ----- ☒ -----

acceptable results all RPD  
within  $\pm 20\%$

6. Matrix Spike Analysis ----- ☐ -----

N/A

7. Sample Results Verification ----- ☒ -----

Verified NO Transcription errors

SDG # 40442-5

Project No. 913-1101.211

Acceptable  
YES NO

8. Other QC -----

N/A

9. Field Duplicates -----

N/A

10. Overall Assessment -----

1 Regularity form 1's for Blacks



# Accu-Labs Research, Inc.

4663 Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 01/08/92 PAGE 1

KATHY SMIT  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40442-5  
Date Samples Received: 10/30/91  
Customer PO Number: PROJ# 913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -                    | 8734-40442-5-1  | 8734-40442-5-2       | 8734-40442-5-3       | 8734-40442-5-4       |
|--------------------------------------|-----------------|----------------------|----------------------|----------------------|
| Sponsor Designation -                | KELLY A         | KELLY B              | PW-3-RFK-R           | TW-41-RFK            |
| Date Collected -                     | 10/28/91        | 10/28/91             | 10/29/91             | 10/29/91             |
| Determinations in pCi/L unless noted |                 |                      |                      |                      |
|                                      | <u>5X Blank</u> |                      |                      |                      |
| Gross Alpha - total                  | ---             | 5 ± 4 *              | 3 ± 4 *              | 11 ± 8 *             |
| Radium-226 - total                   | 0.7             | 0.0 ± 0.2 * <u>u</u> | 0.1 ± 0.2 * <u>u</u> | 0.0 ± 0.2 * <u>u</u> |
| Radium-228 - total                   | 0.3             | 0.7 ± 0.6 *          | 0.4 ± 0.5 *          | 0.1 ± 0.8 * <u>u</u> |
| Radon-222 - total                    | 17.2            | 22 ± 27 * <u>u</u>   | 22 ± 28 * <u>u</u>   | 270 ± 30 *           |
| Uranium - total                      | ---             | <0.002               | <0.002               | <0.002               |
| (mg/L)                               | ---             |                      |                      |                      |

|                       |                |
|-----------------------|----------------|
| ALR Designation -     | 8734-40442-5-5 |
| Sponsor Designation - | TW-43-CCY      |
| Date Collected -      | 10/28/91       |

|                         |             |
|-------------------------|-------------|
| Gross Alpha - dissolved | 10 ± 15 *   |
| Gross Alpha - total     | 970 ± 170 * |
| Radium-226 - dissolved  | 1.3 ± 0.3 * |
| Radium-226 - total      | 21 ± 1 *    |
| Radium-228 - dissolved  | 1.0 ± 0.6 * |
| Radium-228 - total      | 2.6 ± 1.1 * |
| Radon-222 - total       | 84 ± 31 *   |
| Uranium - dissolved     |             |
| (mg/L)                  | <0.002      |
| Uranium - total         |             |
| (mg/L)                  | 0.030       |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By:

Bud Summers  
Radiochemistry Supervisor

BS/ep

40442-12

2/21/92  
Klorie  
2/5/92

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE MM750270  
 LABORATORY ALR SAMPLES/MATRIX water  
EB-Spoon  
 SDG # 40464-1

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES:

Validated by: Kenny Jones Date: 2/9/92  
 Reviewed by: Timothy J. [Signature] Date: 2/21/92

SDG # 40464-1 Project No. 913-1181.211

Acceptable  
YES NO

8. Other QC .....            X

N/A.

9. Field Duplicates .....            X

N/A

10. Overall Assessment ..... ✓

1 Recounting form's for Blankes



# Accu-Labs Research, Inc.

1663 Table Mountain Drive Golden, Colorado 80403-1650  
303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 12/18/91 PAGE 1

KATHY SMIT  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40464-1  
Date Samples Received: 10/31/91  
Customer PO Number: PROJ# 913-1101

These samples to be disposed of 30 days after the date of this report.

ALR Designation - 8734-40464-1-1  
Sponsor Designation - EB-SPOON  
Date Collected - 10/29/91

Determinations in pCi/L unless noted

|                           |                 |                    |
|---------------------------|-----------------|--------------------|
|                           | <u>5x Blank</u> |                    |
| Gross Alpha - total       | ---             | $9 \pm 2$          |
| Radium-226 - total        | 0.2             | $0.2 \pm 0.2 = U$  |
| Radium-228 - total        | 1-0             | $-0.6 \pm 0.6 = U$ |
| Uranium - total<br>(mg/L) | ---             | <0.002             |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$ .

By:

Bud Summers  
Radiochemistry Supervisor

BS/dh

Kennedy  
Laurie  
12/4/92

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Mon Santo  
 LABORATORY ALR SAMPLES/MATRIX Water  
TW-39, TW-12, TW-55,  
 SDG # 40335-6 TW-45, TW-10, TW-37

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>2</u>       | <u>2</u>       | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u>1</u>       | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u>1</u>       | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u>1</u>       | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.

M = Data qualified due to major problems.

Z = Data unacceptable.

X = Problems, but do not affect data.

NOTES: \_\_\_\_\_  
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Validated by: Kenneth Linn Date: 2/5/92  
 Reviewed by: Michael D. Hughes Date: 2/21/92

SDG # 40335-6Project No. 913-1101-211Acceptable  
YES NO1. Holding Times ----- ☒preservatives used, holding time acceptable  
analyzed within 6 months2. Calibrations ----- ☒Verification LCS against True value for  
Alpha and Beta verified Blanks used,  
acceptable calibration3. Blanks ----- ☒Requalify sample results with "U"  
qualification for value less than 5x  
the Blank Results4. Laboratory Control Standard ----- ☒Values fall within QC limits of  
80-120% Recal 224  $2290/2380 \times 100 = 96.2$ 5. Duplicate Analysis ----- ☒acceptable and within  $\pm 20\%$   
of RPD6. Matrix Spike Analysis ----- ☐N/A7. Sample Results Verification ----- ☒Verified no transcription errors made

SDG # 40335-6 Project No. 913-1101.211

Acceptable  
YES NO

8. Other QC .....        1

N/A

9. Field Duplicates .....        1

N/A

10. Overall Assessment ..... 2

1 reanalysis form 1's for Blanks



# Accu-Labs Research, Inc.

1663 Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 12/18/91 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40335-6  
Date Samples Received: 10/23/91  
Customer PO Number: PROJ# 913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -                    | 8734-40335-6-1  | 8734-40335-6-2 | 8734-40335-6-3 | 8734-40335-6-4 |
|--------------------------------------|-----------------|----------------|----------------|----------------|
| Sponsor Designation -                | TW-39-RFK       | TW-12-RFK      | TW-35-RFK      | TW-45-RFK      |
| Date Collected -                     | 10/21/91        | 10/21/91       | 10/21/91       | 10/21/91       |
| Determinations in pCi/L unless noted |                 |                |                |                |
|                                      | <i>5x Blank</i> |                |                |                |
| Gross Alpha - total                  | 1-3             | -1 ± 11 *U     | 9 ± 14 *       | -5 ± 11 *      |
| Radium-226 - total                   | 0.2             | 0.0 ± 0.3 *U   | 0.0 ± 0.2 *U   | 0.1 ± 0.2 *U   |
| Radium-228 - total                   | 1-0             | 0.0 ± 0.5 *U   | -0.3 ± 0.4 *U  | 0.1 ± 0.6 *U   |
| Radon-222 - total                    | 15.2            | 99 ± 25 *      | 240 ± 30 *     | 290 ± 30 *     |
| Uranium - total                      |                 |                |                |                |
| (mg/L)                               | ---             | <0.002         | <0.002         | 0.004          |

| ALR Designation -     | 8734-40335-6-5 | 8734-40335-6-6 |
|-----------------------|----------------|----------------|
| Sponsor Designation - | TW-10-RFK      | TW-37-RFK      |
| Date Collected -      | 10/21/91       | 10/21/91       |
| Gross Alpha - total   | 4 ± 6 *        | 3 ± 8 *        |
| Radium-226 - total    | 0.0 ± 0.4 *U   | 0.2 ± 0.3 *    |
| Radium-228 - total    | 1.3 ± 0.6 *    | 0.2 ± 0.6 *U   |
| Radon-222 - total     | 540 ± 30 *     | 680 ± 40 *     |
| Uranium - total       |                |                |
| (mg/L)                | <0.002         | <0.002         |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By: Bud Summers  
Radiochemistry Supervisor

BS/ep  
97

Klein  
2/5/92  
M. H. H.  
2/21/92

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Monsanto  
 LABORATORY AIR SAMPLES/MATRIX Water  
TW-30, EB-01, TW-26  
 SDG # 40308-9 TW-13, TW-26D, TW-15  
Rougher, TW-44, FB-04

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u>0</u>       | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u>0</u>       | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u>0</u>       | <u>0</u>   |

0 = Data had no problems or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

NOTES: \_\_\_\_\_  
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Validated by: Kenneth G. [Signature] Date: 2/3/92  
 Reviewed by: [Signature] Date: 2/21/92

SDG # 40308-9 Project No. 913-1101.211

Acceptable  
YES ✓ NO

1. Holding Times -----  
holding time acceptable for samples  
within 6 months

2. Calibrations ----- ✓  
verified std and blanks were  
used, results within limits

3. Blanks ----- ✓  
Reanalyzed results within "1" per  
5X rule

4. Laboratory Control Standard ----- ✓  
all LCS within control limits of  
80-120% Recal Alpha  $286/222 \times 100 = 102$

5. Duplicate Analysis ----- ✓  
verified results fall within limits  
Results acceptable

6. Matrix Spike Analysis -----  
N/A

7. Sample Results Verification ----- ✓  
Results verified NO <sup>transcribe</sup> Transcribe  
ERROR.

SDG #

Project No.

AC  
YES

NO

## 8. Other QC

11/1A

## 9. Field Duplicates

Recal Field Dup Gross Alpha outside  
of RPD limits Re <sup>Revised</sup> Quality

## 10. Overall Assessment

Regularify form 1's for blanks



# Accu-Labs Research, Inc.

1663 Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 01/16/92 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40308-9  
Date Samples Received: 10/22/91  
Customer PO Number: PROJECT #913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -     | 8734-40308-9-1 | 8734-40308-9-2 | 8734-40308-9-3 | 8734-40308-9-4 |
|-----------------------|----------------|----------------|----------------|----------------|
| Sponsor Designation - | TW-30-CCR      | EB-01-CCR      | TW-26-RFK      | TW-13-RFK      |
| Date Collected -      | 10/18/91       | 10/18/91       | 10/20/91       | 10/20/91       |

Determinations in pCi/L unless noted

*Sx Rf/k*

|                               |      |                       |                      |                       |                      |
|-------------------------------|------|-----------------------|----------------------|-----------------------|----------------------|
| Gross Alpha - dissolved       | 0.8  | 12 ± 8 *              | ----                 | ----                  | ----                 |
| Gross Alpha - total           |      | 11 ± 8 *              | 1 ± 1 *              | 6 ± 6 *               | 8 ± 4 *              |
| Radium-226 - dissolved        | 0.5  | 0.0 ± 0.2 * <i>u</i>  | ----                 | ----                  | ----                 |
| Radium-226 - total            |      | 0.1 ± 0.2 * <i>u</i>  | 0.0 ± 0.2 * <i>u</i> | 0.4 ± 0.2 *           | 0.1 ± 0.2 * <i>u</i> |
| Radium-228 - dissolved        | 1.1  | 0.2 ± 0.5 * <i>u</i>  | ----                 | ----                  | ----                 |
| Radium-228 - total            |      | -0.2 ± 0.5 * <i>u</i> | 0.0 ± 0.5 * <i>u</i> | -0.1 ± 0.6 * <i>u</i> | 0.6 ± 0.7 * <i>u</i> |
| Radon-222 - total             | 13.2 | 55 ± 18 *             | 13 ± 17 * <i>u</i>   | 94 ± 20 *             | 380 ± 30 *           |
| Uranium - dissolved<br>(mg/L) |      | <0.002                | ----                 | ----                  | ----                 |
| Uranium - total<br>(mg/L)     |      | <0.002                | 0.005                | <0.002                | <0.002               |

| ALR Designation -     | 8734-40308-9-5 | 8734-40308-9-6 | 8734-40308-9-7 | 8734-40308-9-8 |
|-----------------------|----------------|----------------|----------------|----------------|
| Sponsor Designation - | TW-26-RFK-D    | TW-15-RFK      | HOOPER         | TW-44-RFK      |
| Date Collected -      | 10/20/91       | 10/20/91       | 10/20/91       | 10/20/91       |

|                               |                      |                      |                      |                       |
|-------------------------------|----------------------|----------------------|----------------------|-----------------------|
| Gross Alpha - dissolved       | ----                 | ----                 | ----                 | 6 ± 6 *               |
| Gross Alpha - total           | 12 ± 7 *             | 7 ± 3 *              | 8 ± 7 *              | 79 ± 20 *             |
| Radium-226 - dissolved        | ----                 | ----                 | ----                 | 0.0 ± 0.2 * <i>u</i>  |
| Radium-226 - total            | 0.5 ± 0.3 * <i>u</i> | 0.0 ± 0.2 * <i>u</i> | 0.0 ± 0.3 * <i>u</i> | 0.4 ± 0.2 * <i>u</i>  |
| Radium-228 - dissolved        | ----                 | ----                 | ----                 | -0.1 ± 0.7 * <i>u</i> |
| Radium-228 - total            | 0.1 ± 0.7 * <i>u</i> | 0.4 ± 0.7 * <i>u</i> | 0.1 ± 0.5 * <i>u</i> | 0.1 ± 0.5 * <i>u</i>  |
| Radon-222 - total             | 92 ± 20 *            | 520 ± 30 *           | 43 ± 19 *            | 77 ± 24 *             |
| Uranium - dissolved<br>(mg/L) | ----                 | ----                 | ----                 | <0.002                |
| Uranium - total<br>(mg/L)     | <0.002               | <0.002               | <0.002               | <0.002                |

*Final  
2/21/92*

**A N A L Y S I S   R E P O R T**

DATE: 01/16/92      PAGE 2

Lab Job Number 8734-40308-9

These samples to be disposed of 30 days after the date of this report.

ALR Designation -      8734-40308-9-9

Sponsor Designation -      FB-04-RFK

Date Collected -      10/20/91

---

Determinations in pCi/L unless noted

|                           |                    |
|---------------------------|--------------------|
| Gross Alpha - total       | $1 \pm 1 *$        |
| Radium-226 - total        | $0.0 \pm 0.3 * u$  |
| Radium-228 - total        | $-0.2 \pm 0.5 * u$ |
| Radon-222 - total         | $28 \pm 22 *$      |
| Uranium - total<br>(mg/L) | $<0.002$           |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level,  $1.96\sigma$ .

By: Bud Summers

Bud Summers  
Radiochemistry Supervisor

BS/ep

*met*  
*2/21/92*

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Monsanto

LABORATORY ALR SAMPLES/MATRIX water

SDG # 40265 PW-1, PW-2, PW-3, PW-4,

FR-4, Calif, Mormon B,

B-Mormon C, Nonesuch, TW-2

FB-02

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>12/low</u>  | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u>2/1/92</u>  | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>1/2 0</u>    | <u>0</u>       | <u></u>        | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.

M = Data qualified due to major problems.

Z = Data unacceptable.

X = Problems, but do not affect data.

NOTES: \_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Validated by: Kenny Louie Date: 2/4/92

Reviewed by: John M. Ruppel Date: 2/21/92

SDG # 40265Project No. 913-1101.211Acceptable  
YES NO1. Holding Times ----- X -----

holding time acceptable compared  
Raw Data date vs COC date and  
within 6mo. and was preserved

2. Calibrations ----- X -----

verification std within limits and  
Blanks and LCS, acceptable  
Data

3. Blanks ----- X -----

Requality Results with value less  
than 5x the Blank value with  
"U" Qualifier

4. Laboratory Control Standard ----- X -----

all %R within limits for  
Aqueous samples Recal %R Alpha  $194/222 \text{ RPD} = 87$   
Uranium  $217/244 \text{ RPD} = 88$

5. Duplicate Analysis ----- X -----

Quality Samples with "J" for RPD  $\geq 20\%$

6. Matrix Spike Analysis ----- - -----

N/A

7. Sample Results Verification ----- X -----

verified Results against raw Data

SDG # 40265-11 Project No. 913-1101.211

Acceptable  
YES NO

8. Other QC -----

N/A

9. Field Duplicates -----

N/A

10. Overall Assessment ----- X

- Requalify form 1's for blanks  
- Requalify form 1's for Replicate analysis



# Accu-Labs Research, Inc.

Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT DATE: 12/09/91 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40265-11  
Date Samples Received: 10/18/91  
Customer PO Number: (none)

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -     | 8734-40265-11-1 | 8734-40265-11-2 | 8734-40265-11-3      | 8734-40265-11-4 |
|-----------------------|-----------------|-----------------|----------------------|-----------------|
| Sponsor Designation - | PW-1-RFK        | PW-2-RFK        | PW-3-RFK             | PW-4-RFK        |
| Comments -            |                 |                 | 2-20 ML VIALS BROKEN |                 |
| Date Collected -      | 10/16/91        | 10/16/91        | 10/15/91             | 10/16/91        |

Determinations in pCi/L unless noted

|                     |                |                    |                    |                    |
|---------------------|----------------|--------------------|--------------------|--------------------|
|                     | <u>513/600</u> |                    |                    |                    |
| Gross Alpha - total | 3.0            | $-2 \pm 6 * U$     | $0 \pm 6 * U$      | $0 \pm 6 * U$      |
| Radium-226 - total  | 1.9            | $-0.2 \pm 0.6 * U$ | $-0.4 \pm 0.6 * U$ | $-0.4 \pm 0.5 * U$ |
| Radium-228 - total  | 0.3            | $0.0 \pm 0.4 * U$  | $-0.3 \pm 0.6 * U$ | $-0.1 \pm 0.6 * U$ |
| Radon-222 - total   | 15-1           | $340 \pm 30 * J$   | $340 \pm 30 * J$   | ----               |
| Uranium - total     |                |                    |                    | $260 \pm 30 * J$   |
| (mg/L)              | - - -          | <0.002             | 0.002              | <0.002             |

| ALR Designation -     | 8734-40265-11-5      | 8734-40265-11-6 | 8734-40265-11-7 | 8734-40265-11-8 |
|-----------------------|----------------------|-----------------|-----------------|-----------------|
| Sponsor Designation - | FB-4-RFK             | CALF SPRING     | MORMON B        | MORMON C        |
| Comments -            | SUBSTITUTED FB-1-RFK |                 |                 |                 |
| Date Collected -      | 10/16/91             | 10/16/91        | 10/16/91        | 10/16/91        |

|                     |                    |                    |                    |                    |
|---------------------|--------------------|--------------------|--------------------|--------------------|
| Gross Alpha - total | $0 \pm 1 * U$      | $-1 \pm 6 * U$     | $1 \pm 8 * U$      | $0 \pm 7 * U$      |
| Radium-226 - total  | $-0.3 \pm 0.6 * U$ | $-0.1 \pm 0.6 * U$ | $-0.4 \pm 0.6 * U$ | $-0.5 \pm 0.6 * U$ |
| Radium-228 - total  | $0.2 \pm 0.5 * U$  | $-0.2 \pm 0.5 * U$ | $-0.3 \pm 0.5 * U$ | $-0.1 \pm 0.4 * U$ |
| Radon-222 - total   | $34 \pm 23 * J$    | $240 \pm 30 * J$   | $330 \pm 30 * J$   | $250 \pm 30 * J$   |
| Uranium - total     |                    |                    |                    |                    |
| (mg/L)              | <0.002             | 0.004              | <0.002             | <0.002             |

Klavin  
2/4/92

WLC  
2/21/92

A N A L Y S I S   R E P O R T

DATE: 12/09/91      PAGE 2

Lab Job Number 8734-40265-11

These samples to be disposed of 30 days after the date of this report.

|                       |                 |                  |                  |
|-----------------------|-----------------|------------------|------------------|
| ALR Designation -     | 8734-40265-11-9 | 8734-40265-11-10 | 8734-40265-11-11 |
| Sponsor Designation - | HOMESTEAD       | TW-2-RFK         | FB-02-RFK        |
| Comments -            |                 |                  |                  |
| Date Collected -      | 10/17/91        | 10/17/91         | 10/17/91         |

Determinations in pCi/L unless noted

|                           |                |                |                |
|---------------------------|----------------|----------------|----------------|
| Gross Alpha - total       | $6 \pm 8$      | $1 \pm 6$      | $0 \pm 1$      |
| Radium-226 - total        | $-0.4 \pm 0.6$ | $-0.5 \pm 0.7$ | $-0.5 \pm 0.5$ |
| Radium-228 - total        | $0.0 \pm 0.5$  | $0.0 \pm 0.5$  | $-0.4 \pm 0.4$ |
| Radon-222 - total         | $140 \pm 20$   | $160 \pm 20$   | $-12 \pm 19$   |
| Uranium - total<br>(mg/L) | <0.002         | <0.002         | <0.002         |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$ .

By: Bud Summers  
Bud Summers  
Radiochemistry Supervisor

BS/ep  
-ep

*KLW*  
*2/21/92*  
*Klowe*  
*2/4/92*

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101.211 SITE Monsanto

LABORATORY ALR SAMPLES/MATRIX Water

SDG # 40392-9 Boy Scout, Spring Box,

Finch, Farm A, Ledy A,

Ledy B, Farm B, EB-03, TW-38

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u>Minor</u>   | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u>/</u>       | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u>/</u>       | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u>/</u>       | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.

M = Data qualified due to major problems.

Z = Data unacceptable.

X = Problems, but do not affect data.

### NOTES:

alpha / Beta Recounted 3/4/92

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Validated by: Kenny Louie Date: 2/4/92

Reviewed by: Mark Pugh Date: 2/21/92

SDG # 40392 Project No. 913-1101.201

Acceptable  
YES NO

1. Holding Times ----- X -----

holding time acceptable analyzed  
within 6 months, preserved OK

2. Calibrations ----- X -----

Verified sample LCS QA true value  
within limits for nuclides and Blanks  
verified within limits

3. Blanks ----- X -----

Quality Results with value less  
than 5x the Blank value with  
"U" Qualifier

4. Laboratory Control Standard ----- X -----

all LCS within QC limits of 80-120%  
Reed Alpha  $188/222 = 84$  Reed Pu226  
 $2590/2350 = 108.8$

5. Duplicate Analysis ----- X -----

Qualify sample results with "J"  
for sample associated for RPD  
outside of limits 40392-7 Not within recovery limits

6. Matrix Spike Analysis -----        -----

N/A

7. Sample Results Verification ----- X -----

Verified NO Transcribe Error

SDG # 40392-9 Project No. 913-1101.211

Acceptable  
YES NO

8. Other QC .....                     

N/A

9. Field Duplicates .....                     

N/A

10. Overall Assessment ..... X

- Qualify form 1's for blank
- Qualify form 1's for Field Duplicate analysis, for value greater than RPD



# Accu-Labs Research, Inc.

33 Table Mountain Drive Golden, Colorado 80403-1650  
(303) 277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 01/06/92 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40392-9  
Date Samples Received: 10/26/91  
Customer PO Number: PROJECT #913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -     | 8734-40392-9-1 | 8734-40392-9-2 | 8734-40392-9-3 | 8734-40392-9-4 |
|-----------------------|----------------|----------------|----------------|----------------|
| Sponsor Designation - | BOY SCOUT      | SPRING BOX     | FINCH          | FORMATION A    |
| Date Collected -      | 10/24/91       | 10/24/91       | 10/24/91       | 10/24/91       |

Determinations in pCi/L unless noted

*Sx Results*

|                     |      | 3 ± 3 *       | 1 ± 3 *        | 3 ± 5 *        | 0 ± 4 *        |
|---------------------|------|---------------|----------------|----------------|----------------|
| Gross Alpha - total | ---  |               |                |                |                |
| Radium-226 - total  | 0.7  | 0.2 ± 0.2 * U | 0.1 ± 0.3 * U  | 0.1 ± 0.2 * U  | 3.4 ± 0.4 *    |
| Radium-228 - total  | 0.4  | 0.2 ± 0.6 * U | -0.2 ± 0.6 * U | -0.3 ± 0.6 * U | 0.7 ± 0.7 *    |
| Radon-222 - total   | 17.2 | 32 ± 16 * J   | 160 ± 30 * J   | 360 ± 40 * J   | 2200 ± 100 * J |
| Uranium - total     | ---  |               |                |                |                |
| (mg/L)              |      | <0.002        | <0.002         | <0.002         | <0.002         |

| ALR Designation -     | 8734-40392-9-5 | 8734-40392-9-6 | 8734-40392-9-7 | 8734-40392-9-8 |
|-----------------------|----------------|----------------|----------------|----------------|
| Sponsor Designation - | LEDGER A       | LEDGER B       | FORMATION B    | EB-03-CCR      |
| Date Collected -      | 10/24/91       | 10/24/91       | 10/24/91       | 10/24/91       |

|                     |  | 1 ± 4 *        | 1 ± 3 *       | 6 ± 5 *      | 1 ± 1 *       |
|---------------------|--|----------------|---------------|--------------|---------------|
| Gross Alpha - total |  |                |               |              |               |
| Radium-226 - total  |  | 0.2 ± 0.2 * U  | 0.0 ± 0.2 * U | 2.4 ± 0.4 *  | 0.1 ± 0.2 * U |
| Radium-228 - total  |  | -0.2 ± 0.7 * U | 0.7 ± 0.7 *   | 0.7 ± 0.8 *  | 0.3 ± 0.6 * U |
| Radon-222 - total   |  | 720 ± 40 * J   | 610 ± 40 * J  | 110 ± 30 * J | 10 ± 26 * J   |
| Uranium - total     |  |                |               |              |               |
| (mg/L)              |  | 0.002          | <0.002        | 0.004        | <0.002        |

*12/1/92*

*Florie 2/4/92*

A N A L Y S I S   R E P O R T

DATE: 01/06/92      PAGE 2

Lab Job Number 8734-40392-9

These samples to be disposed of 30 days after the date of this report.

ALR Designation -      8734-40392-9-9  
Sponsor Designation -      TU-38-CCR  
Date Collected -      10/24/91

Determinations in pCi/L unless noted

|                         |                      |
|-------------------------|----------------------|
| Gross Alpha - dissolved | -1 ± 5 *             |
| Gross Alpha - total     | 5 ± 7 *              |
| Radium-226 - dissolved  | 0.1 ± 0.2 * <i>u</i> |
| Radium-226 - total      | 1.0 ± 0.3 * <i>u</i> |
| Radium-228 - dissolved  | 0.5 ± 0.6 *          |
| <br>                    |                      |
| Radium-228 - total      | 3.4 ± 2.1 *          |
| Radon-222 - total       | 130 ± 30 * <i>J</i>  |
| Uranium - dissolved     |                      |
| (mg/L)                  | <0.002               |
| Uranium - total         |                      |
| (mg/L)                  | <0.002               |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By: *Bud Summers*  
Bud Summers  
Radiochemistry Supervisor

BS/dh *dh*

*2/21/92*

*Klone  
2/4/92*

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101-211 SITE Monsanto  
 LABORATORY ALR SAMPLES/MATRIX water  
 SDG # 40377-5 TW-50, Harris, Lewis,  
TW-16, TW-18

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u>None</u>    | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     |                | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     |                | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       |                | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

### NOTES:

- Radium 228 was Recalculated due to error on first calculation
- Sample #1 and 5 Gross Alpha were realigned due to high salts
- All sample in set were high in salts
- Sample #2 Uranium was rerun to match Gross alpha value

Validated by: Kenny Louie Date: 2/4/92  
 Reviewed by: William M. Duplos Date: 2/21/92

SDG # 40377Project No. 913-1101.211Acceptable  
YES NO1. Holding Times ----- ✓ -----Holding Time acceptable for  
samples analyzed within 6 months.2. Calibrations ----- + -----Verified Results for Alpha and Beta counts  
and efficiency. Blanks verified from raw data  
and std. verified from raw data.3. Blanks ----- X -----Quality Results with value less than  
5x the Blank value with 'u' Qualifier4. Laboratory Control Standard ----- ✓ -----all LCS within QC limits of 80-120%Recal Alpha  $^{193}/222 \times 100 = 87$ Recal Raman  $^{203g}/2442 \times 100 = 83.$ 5. Duplicate Analysis ----- + -----acceptable Data and Requalifying6. Matrix Spike Analysis ----- ✓ -----N/A7. Sample Results Verification ----- X -----verified results from Raw Data

SDG # 40377-5 Project No. 913-1101.201

Acceptable  
YES NO

8. Other QC .....                      

N/A

9. Field Duplicates .....                      

N/A

10. Overall Assessment ..... X           

1 Qualify form's for Blanks



# Accu-Labs Research, Inc.

3 Table Mountain Drive Golden, Colorado 80403-1650  
277-9514 FAX (303) 277-9512

## ANALYSIS REPORT

DATE: 12/19/91 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40377-5  
Date Samples Received: 10/25/91  
Customer PO Number: PROJECT # 913-1101

These samples to be disposed of 30 days after the date of this report.

|                       |                |                |                |                |
|-----------------------|----------------|----------------|----------------|----------------|
| ALR Designation -     | 8734-40377-5-1 | 8734-40377-5-2 | 8734-40377-5-3 | 8734-40377-5-4 |
| Sponsor Designation - | TW-50-RFK      | HARRIS         | LEWIS          | TW-16-RFK      |
| Date Collected -      | 10/23/91       | 10/23/91       | 10/23/91       | 10/23/91       |

Determinations in pCi/L unless noted

|                           |               |                |               |               |
|---------------------------|---------------|----------------|---------------|---------------|
| Gross Alpha - total       | -4 ± 13 *     | -3 ± 5 *       | 0 ± 9 *       | -1 ± 8 *      |
| Radium-226 - total        | 0.3 ± 0.2 * U | -0.1 ± 0.4 * U | 0.0 ± 0.2 * U | 0.0 ± 0.2 * U |
| Radium-228 - total        | 0.4 ± 0.6 * U | -0.2 ± 0.6 * U | 0.0 ± 0.7 * U | 0.2 ± 0.6 * U |
| Radon-222 - total         | 200 ± 30 *    | 260 ± 30 *     | 220 ± 30 *    | 120 ± 30 *    |
| Uranium - total<br>(mg/L) | <0.002        | 0.005          | 0.009         | 0.010         |

|                       |                |
|-----------------------|----------------|
| ALR Designation -     | 8734-40377-5-5 |
| Sponsor Designation - | TW-16-RFK      |
| Date Collected -      | 10/23/91       |

|                           |                |
|---------------------------|----------------|
| Gross Alpha - total       | -7 ± 8 *       |
| Radium-226 - total        | 0.2 ± 0.2 * U  |
| Radium-228 - total        | -0.1 ± 0.6 * U |
| Radon-222 - total         | 93 ± 26 *      |
| Uranium - total<br>(mg/L) | <0.002         |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By: Bud Summers  
Bud Summers  
Radiochemistry Supervisor

BS/ep  
ep

*[Handwritten signature]*  
2/21/92

# RADIOCHEMICAL DATA ASSESSMENT SUMMARY

PROJECT NO. 913-1101-211 SITE Morison  
 LABORATORY ALR SAMPLES/MATRIX water  
EB-02, TW-22, TW-23,  
 SDG # 40354-10 FB05, SW, MORRISON, TW-33,  
TW-48, TW-49, SW-49

## DATA ASSESSMENT SUMMARY

|                        | ALPHA<br>SCINT. | L.B.<br>SCINT. | GAMMA<br>SPEC. | FLUOR.     |
|------------------------|-----------------|----------------|----------------|------------|
| 1. HOLDING TIMES       | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 2. CALIBRATIONS        | <u>0</u>        | <u>0</u>       | <u>None</u>    | <u>0</u>   |
| 3. BLANKS              | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 4. LCS                 | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 5. DUPLICATE ANALYSIS  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 6. MATRIX SPIKE        | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 7. SAMPLE VERIFICATION | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |
| 8. OTHER QC            | <u>N/A</u>      | <u>N/A</u>     | <u></u>        | <u>N/A</u> |
| 9. OVERALL ASSESSMENT  | <u>0</u>        | <u>0</u>       | <u></u>        | <u>0</u>   |

0 = Data had no problems/or qualified due to minor problems.  
 M = Data qualified due to major problems.  
 Z = Data unacceptable.  
 X = Problems, but do not affect data.

### NOTES:

Sample 2, 3, 5, 6, 7, 8, 9 and 10 high on  
Salts / case narrative

Validated by: Kenny Lorie Date: 2/4/92  
 Reviewed by: Mike M. Campbell Date: 2/21/92

SDG # 40354-10 Project No. 913-1101.211

Acceptable  
YES NO

1. Holding Times ----- ☒

acceptable, preservative used  
and analyzed within 6 months

2. Calibrations ----- ☒

verified that <sup>using</sup> True QA LCS, is within  
limits, verified Blanks within  
limits.

3. Blanks ----- ☒

Requalify sample Results with "U"  
for values  $\leq 5 \times$  the Blank value

4. Laboratory Control Standard ----- ☒

Verified  $\rho_{012}$  within QC limits  
Recal LCS value for Alpha  $2^{30}/126 \times 100 = 101.7$   
Data acceptable

5. Duplicate Analysis ----- ☒

Verified Data that NO transcription  
error all Dup within QC limits  
for RPD sample results acceptable

6. Matrix Spike Analysis ----- ☐

N/A

7. Sample Results Verification ----- ☒

verified NO transcription error,

SDG # 40354-10 Project No. 913-1101-211

Acceptable  
YES NO

8. Other QC .....                     

N/A

9. Field Duplicates .....                     

NO Field Dup sent in

10. Overall Assessment .....                     

X

Requalify form 1's for Blanks



# Accu-Labs Research, Inc.

Table Mountain Drive Golden, Colorado 80403-1650  
277-9514 FAX (303) 277-9512

## ANALYSIS REPORT DATE: 12/23/91 PAGE 1

DEBBIE GRIMM  
CHEN-NORTHERN, INC.  
P.O. BOX 30615  
BILLINGS, MT 59107

Lab Job Number: 8734-40354-10  
Date Samples Received: 10/24/91  
Customer PO Number: PROJECT #913-1101

These samples to be disposed of 30 days after the date of this report.

| ALR Designation -     | 8734-40354-10-1 | 8734-40354-10-2 | 8734-40354-10-3 | 8734-40354-10-4 |
|-----------------------|-----------------|-----------------|-----------------|-----------------|
| Sponsor Designation - | EB-02-RFK       | TW-22-RFK       | TW-23-RFK       | FB-05-RFK       |
| Date Collected -      | 10/21/91        | 10/22/91        | 10/22/91        | 10/22/91        |

Determinations in pCi/L unless noted

|                            |               |                   |                   |                    |                   |
|----------------------------|---------------|-------------------|-------------------|--------------------|-------------------|
|                            | <i>SXRBak</i> |                   |                   |                    |                   |
| Gross Alpha - dissolved    | <i>1.2</i>    | ----              | $-1 \pm 9^*$      | ----               | ----              |
| Gross Alpha - total        |               | $0 \pm 1^* U$     | $5 \pm 11^*$      | $-6 \pm 10^*$      | $-1 \pm 1^* U$    |
| Radium-226 - dissolved     | <i>0.5</i>    | ----              | $0.3 \pm 0.3^* U$ | ----               | ----              |
| Radium-226 - total         |               | $0.1 \pm 0.3^* U$ | $0.6 \pm 0.4^*$   | $0.3 \pm 0.4^* U$  | $0.0 \pm 0.3^* U$ |
| Radium-228 - dissolved     | <i>0.3</i>    | ----              | $0.6 \pm 0.5^*$   | ----               | ----              |
| Radium-228 - total         |               | $0.4 \pm 0.8^*$   | $0.4 \pm 0.5^*$   | $-0.2 \pm 0.6^* U$ | $0.4 \pm 0.7^*$   |
| Radon-222 - total          | <i>17.3</i>   | $51 \pm 24^*$     | $51 \pm 24^*$     | $63 \pm 25^*$      | $52 \pm 25^*$     |
| Uranium - dissolved (mg/L) |               | ----              | 0.008             | ----               | ----              |
| Uranium - total (mg/L)     |               | <0.002            | <0.002            | <0.002             | <0.002            |

| ALR Designation -     | 8734-40354-10-5 | 8734-40354-10-6 | 8734-40354-10-7 | 8734-40354-10-8 |
|-----------------------|-----------------|-----------------|-----------------|-----------------|
| Sponsor Designation - | SOUTHWEST       | MORMON          | TW-33-RFK       | TW-48-RFK       |
| Date Collected -      | 10/22/91        | 10/22/91        | 10/22/91        | 10/23/91        |

|                            |                   |                   |                   |                   |
|----------------------------|-------------------|-------------------|-------------------|-------------------|
| Gross Alpha - dissolved    | ----              | ----              | $3 \pm 7^*$       | ----              |
| Gross Alpha - total        | $-2 \pm 9^*$      | $-5 \pm 7^*$      | $5 \pm 7^*$       | $2 \pm 6^*$       |
| Radium-226 - dissolved     | ----              | ----              | $0.0 \pm 0.3^* U$ | ----              |
| Radium-226 - total         | $0.0 \pm 0.4^* U$ | $0.0 \pm 0.4^* U$ | $0.2 \pm 0.4^* U$ | $0.1 \pm 0.4^* U$ |
| Radium-228 - dissolved     | ----              | ----              | $0.2 \pm 0.7^* U$ | ----              |
| Radium-228 - total         | $0.4 \pm 0.6^*$   | $0.6 \pm 0.5^*$   | $0.5 \pm 0.6^*$   | $0.6 \pm 0.5^*$   |
| Radon-222 - total          | $160 \pm 30^*$    | $130 \pm 30^*$    | $570 \pm 40^*$    | $270 \pm 30^*$    |
| Uranium - dissolved (mg/L) | ----              | ----              | <0.002            | ----              |
| Uranium - total (mg/L)     | <0.002            | <0.002            | 0.002             | <0.002            |

*Klonie*  
*2/4/92* *1/18/92*  
*2/21/92*

A N A L Y S I S   R E P O R T

DATE: 12/23/91      PAGE 2

Lab Job Number 8734-40354-10

These samples to be disposed of 30 days after the date of this report.

|                       |                 |                  |
|-----------------------|-----------------|------------------|
| ALR Designation -     | 8734-40354-10-9 | 8734-40354-10-10 |
| Sponsor Designation - | TW-49-RFK       | SW-49-RFK        |
| Date Collected -      | 10/23/91        | 10/23/91         |

Determinations in pCi/L unless noted

|                           |                |                |
|---------------------------|----------------|----------------|
| Gross Alpha - total       | -1 ± 6 * U     | -5 ± 5 *       |
| Radium-226 - total        | 0.0 ± 0.3 * U  | -0.3 ± 0.4 * U |
| Radium-228 - total        | -0.2 ± 0.5 * U | 0.4 ± 0.6 *    |
| Radon-222 - total         | 270 ± 30 *     | 210 ± 30 *     |
| Uranium - total<br>(mg/L) | 0.010          | <0.002         |

\* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ.

By: Bud Summers  
 Bud Summers  
 Radiochemistry Supervisor

BS/ep

Klowi  
 2/4/92

1/16/92  
 2/21/92

APPENDIX S

ATTACHMENT 3

INORGANIC DATA ASSESSMENT SUMMARY  
SEDIMENT, SOIL AND SOURCE SAMPLES

SDG # Parts 5, 6, 7, 8, 9 Project No. 913-1101-211

Acceptable  
YES NO

1. Holding Times ----- ✓ -----

All samples analyzed within holding times for metals and wetchem except COP (qualified UT).

2. Calibrations ----- ✓ -----

All IGV/CCVs acceptable except As CCV in Pt 5 and Cu IGV in Pt 6 (qualified for UT); Proper standards used,  $r^2 > 0.995$ .

3. Blanks ----- ✓ -----

Method blanks analyzed per batch; all results acceptable.

4. ICP Interference Check Sample (ICS) ----- ✓ -----

ICS analyzed at proper frequency; results acceptable.

5. Laboratory Control Sample (LCS) ----- ✓ -----

LCS for K, Al out on Pts 5, 6; Al+K qualified as J where applicable. All other LCS OK.

6. Duplicate Sample Analysis ----- ✓ -----

RPD's out for Fe, K, Zn, on Part 6; results qualified as J or UT as applicable all other RPD's OK.

7. Matrix Spike Sample Analysis ----- ✓ -----

Spike %R out for Se, Ag on Pt 5; Se & As on Pt 6; As, Cd & Cu on Pt 7; and As, Cd, Se on Pt 8; Results qualified as J or UT as applicable. All other %R acceptable.

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121205

Matrix (Soil/Water): Soil

Sample ID: S-1A

Level (Low/Med): \_\_\_\_\_

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q | M   |
|-----------|--------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum                 | 21,500        |   |   | P   |
| 7440-38-2 | Arsenic                  | 5.4           | J |   | H   |
| 7440-41-7 | Beryllium                | 3.5           |   |   | P   |
| 7440-43-9 | Cadmium                  | 83.4          |   |   | P   |
| 7440-47-3 | Chromium                 | 98.9          |   |   | P   |
| 7440-50-8 | Copper                   | 40            |   |   | P   |
| 7439-89-6 | Iron                     | 16,900        |   |   | P   |
| 7439-92-1 | Lead                     | 53            |   |   | F   |
| 7439-96-5 | Manganese                | 387           |   |   | P   |
| 7440-02-0 | Nickel                   | 55            |   |   | P   |
| 7440-09-7 | Potassium                | 5,200         | J |   | A   |
| 7782-49-2 | Selenium                 | 1.4           | J | X | H   |
| 7440-22-4 | Silver                   | 8.5           | J | X | P   |
| 7440-23-5 | Sodium                   | 849           |   |   | A   |
| 7440-62-2 | Vanadium                 | 155           |   |   | P   |
| 7440-66-6 | Zinc                     | 1,740         |   |   | P   |
|           | Fluoride                 | 13.1          |   |   | E   |
|           | Cation Exchange Capacity | 14.3          |   |   | A   |
|           | Nitrate/Nitrite as N     | 4.4           |   |   | ACR |
|           | pH                       | 7.0           |   |   | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*MWA*  
3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121208

Matrix (Soil/Water): Soil

Sample ID: S-4A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q | M   |
|-----------|--------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum                 | 17,300        |   |   | P   |
| 7440-38-2 | Arsenic                  | 6.9           | J |   | H   |
| 7440-41-7 | Beryllium                | 3.7           |   |   | P   |
| 7440-43-9 | Cadmium                  | 39.0          |   |   | P   |
| 7440-47-3 | Chromium                 | 121           |   |   | P   |
| 7440-50-8 | Copper                   | 30            |   |   | P   |
| 7439-89-6 | Iron                     | 24,100        |   |   | P   |
| 7439-92-1 | Lead                     | 45            |   |   | F   |
| 7439-96-5 | Manganese                | 1,380         |   |   | P   |
| 7440-02-0 | Nickel                   | 55            |   |   | P   |
| 7440-09-7 | Potassium                | 5,500         | J |   | A   |
| 7782-49-2 | Selenium                 | 0.6           | J | X | H   |
| 7440-22-4 | Silver                   | 4             | J | X | P   |
| 7440-23-5 | Sodium                   | 1,050         |   |   | A   |
| 7440-62-2 | Vanadium                 | 209           |   |   | P   |
| 7440-66-6 | Zinc                     | 610           |   |   | P   |
|           | Fluoride                 | 18.1          |   |   | E   |
|           | Cation Exchange Capacity | 26.2          |   |   | A   |
|           | Nitrate/Nitrite as N     | 4.2           |   |   | ACR |
|           | pH                       | 7.4           |   |   | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*not  
4/5/92*

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121211

Matrix (Soil/Water): Soil

Sample ID: S-7A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION       | C | Q | M   |
|-----------|--------------------------|---------------------|---|---|-----|
| 7429-90-5 | Aluminum                 | 18,500              |   |   | P   |
| 7440-38-2 | Arsenic                  | 4.1                 | J |   | H   |
| 7440-41-7 | Beryllium                | 1                   |   |   | P   |
| 7440-43-9 | Cadmium                  | 6.5                 |   |   | P   |
| 7440-47-3 | Chromium                 | 27                  |   |   | P   |
| 7440-50-8 | Copper                   | 17                  |   |   | P   |
| 7439-89-6 | Iron                     | 15,900              |   |   | P   |
| 7439-92-1 | Lead                     | 22                  |   |   | F   |
| 7439-96-5 | Manganese                | 593                 |   |   | P   |
| 7440-02-0 | Nickel                   | 14                  |   |   | P   |
| 7440-09-7 | Potassium                | 7,700               | J |   | A   |
| 7782-49-2 | Selenium                 | 1.2                 | J | X | H   |
| 7440-22-4 | Silver                   | <3*                 | W | X | P   |
| 7440-23-5 | Sodium                   | 506                 |   |   | A   |
| 7440-62-2 | Vanadium                 | 29                  |   |   | P   |
| 7440-66-6 | Zinc                     | 140                 |   |   | P   |
|           | Fluoride                 | 47.7                |   |   | E   |
|           | Cation Exchange Capacity | Insufficient sample |   |   | A   |
|           | Nitrate/Nitrite as N     | 21                  |   |   | ACR |
|           | pH                       | Insufficient sample |   |   | E   |

\* The silver will be reanalyzed by furnace to achieve a lower detection limit.

Cation Exchange Capacity is reported in meq/100 gm.

*Handwritten:*  
3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121212

Matrix (Soil/Water): Soil

Sample ID: S-8A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q            | M   |
|-----------|--------------------------|---------------|---|--------------|-----|
| 7429-90-5 | Aluminum                 | 21,900        |   |              | P   |
| 7440-38-2 | Arsenic                  | 5.6           | J |              | H   |
| 7440-41-7 | Beryllium                | 2             |   |              | P   |
| 7440-43-9 | Cadmium                  | 13.0          |   |              | P   |
| 7440-47-3 | Chromium                 | 39            |   |              | P   |
| 7440-50-8 | Copper                   | 17            |   |              | P   |
| 7439-89-6 | Iron                     | 17,300        |   |              | P   |
| 7439-92-1 | Lead                     | 24            |   |              | F   |
| 7439-96-5 | Manganese                | 411           |   |              | P   |
| 7440-02-0 | Nickel                   | 30            |   |              | P   |
| 7440-09-7 | Potassium                | 4,600         | J |              | A   |
| 7782-49-2 | Selenium                 | 1.0           | J | <del>X</del> | H   |
| 7440-22-4 | Silver                   | 1.5           | J | <del>X</del> | P   |
| 7440-23-5 | Sodium                   | 424           |   |              | A   |
| 7440-62-2 | Vanadium                 | 63.3          |   |              | P   |
| 7440-66-6 | Zinc                     | 210           |   |              | P   |
|           | Fluoride                 | 33.1          |   |              | E   |
|           | Cation Exchange Capacity | 17.6          |   |              | A   |
|           | Nitrate/Nitrite as N     | 6.1           |   |              | ACR |
|           | pH                       | 7.6           |   |              | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*Not  
3/5/92*

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121213

Matrix (Soil/Water): Soil

Sample ID: S-8A-Dup

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q            | M   |
|-----------|--------------------------|---------------|---|--------------|-----|
| 7429-90-5 | Aluminum                 | 22,500        |   |              | P   |
| 7440-38-2 | Arsenic                  | 6.6           | J |              | H   |
| 7440-41-7 | Beryllium                | 2             |   |              | P   |
| 7440-43-9 | Cadmium                  | 14            |   |              | P   |
| 7440-47-3 | Chromium                 | 42            |   |              | P   |
| 7440-50-8 | Copper                   | 17            |   |              | P   |
| 7439-89-6 | Iron                     | 17,700        |   |              | P   |
| 7439-92-1 | Lead                     | 28            |   |              | F   |
| 7439-96-5 | Manganese                | 409           |   |              | P   |
| 7440-02-0 | Nickel                   | 32            |   |              | P   |
| 7440-09-7 | Potassium                | 5,500         | J |              | A   |
| 7782-49-2 | Selenium                 | 0.8           | J | <del>N</del> | H   |
| 7440-22-4 | Silver                   | 1             | J | <del>N</del> | P   |
| 7440-23-5 | Sodium                   | 399           |   |              | A   |
| 7440-62-2 | Vanadium                 | 67.4          |   |              | P   |
| 7440-66-6 | Zinc                     | 215           |   |              | P   |
|           | Fluoride                 | 33.1          |   |              | E   |
|           | Cation Exchange Capacity | 18.6          |   |              | A   |
|           | Nitrate/Nitrite as N     | 5.1           |   |              | ACR |
|           | pH                       | 7.5           |   |              | E   |

Cation Exchange Capacity is reported in meq/100 gm.

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3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121215

Matrix (Soil/Water): Soil

Sample ID: S-10A

Level (Low/Med): \_\_\_\_\_

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q            | M   |
|-----------|--------------------------|---------------|---|--------------|-----|
| 7429-90-5 | Aluminum                 | 21,900        |   |              | P   |
| 7440-38-2 | Arsenic                  | 9.0           | J |              | H   |
| 7440-41-7 | Beryllium                | 3.7           |   |              | P   |
| 7440-43-9 | Cadmium                  | 76.7          |   |              | P   |
| 7440-47-3 | Chromium                 | 150           |   |              | P   |
| 7440-50-8 | Copper                   | 37            |   |              | P   |
| 7439-89-6 | Iron                     | 17,600        |   |              | P   |
| 7439-92-1 | Lead                     | 35            |   |              | F   |
| 7439-96-5 | Manganese                | 324           |   |              | P   |
| 7440-02-0 | Nickel                   | 60            |   |              | P   |
| 7440-09-7 | Potassium                | 5,500         | J |              | A   |
| 7782-49-2 | Selenium                 | 0.8           | J | <del>N</del> | H   |
| 7440-22-4 | Silver                   | 6.0           | J | <del>N</del> | P   |
| 7440-23-5 | Sodium                   | 2,270         |   |              | A   |
| 7440-62-2 | Vanadium                 | 331           |   |              | P   |
| 7440-66-6 | Zinc                     | 1,780         |   |              | P   |
|           | Fluoride                 | 42.2          |   |              | E   |
|           | Cation Exchange Capacity | 16.5          |   |              | A   |
|           | Nitrate/Nitrite as N     | 5.2           |   |              | ACR |
|           | pH                       | 7.5           |   |              | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*Handwritten:*  
KMT  
3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121216

Matrix (Soil/Water): Soil

Sample ID: S-11A

Level (Low/Med): \_\_\_\_\_

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q            | M   |
|-----------|--------------------------|---------------|---|--------------|-----|
| 7429-90-5 | Aluminum                 | 20,700        |   |              | P   |
| 7440-38-2 | Arsenic                  | 2.6           | J |              | H   |
| 7440-41-7 | Beryllium                | 2.5           |   |              | P   |
| 7440-43-9 | Cadmium                  | 54.5          |   |              | P   |
| 7440-47-3 | Chromium                 | 73.0          |   |              | P   |
| 7440-50-8 | Copper                   | 20            |   |              | P   |
| 7439-89-6 | Iron                     | 14,300        |   |              | P   |
| 7439-92-1 | Lead                     | 5*            | U |              | P   |
| 7439-96-5 | Manganese                | 327           |   |              | P   |
| 7440-02-0 | Nickel                   | 35            |   |              | P   |
| 7440-09-7 | Potassium                | 5,200         | J |              | A   |
| 7782-49-2 | Selenium                 | 3.2           | J | <del>X</del> | H   |
| 7440-22-4 | Silver                   | 3             | J | <del>X</del> | P   |
| 7440-23-5 | Sodium                   | 500           |   |              | A   |
| 7440-62-2 | Vanadium                 | 122           |   |              | P   |
| 7440-66-6 | Zinc                     | 780           |   |              | P   |
|           | Fluoride                 | 34.5          |   |              | E   |
|           | Cation Exchange Capacity | 20.0          |   |              | A   |
|           | Nitrate/Nitrite as N     | 7.5           |   |              | ACR |
|           | pH                       | 6.5           |   |              | E   |

\* This lead value analyzed on the ICP. The sample was inadvertently missed during the lead furnace run.

Cation Exchange Capacity is reported in meq/100 gm.

*Handwritten:*  
KMA  
3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121217

Matrix (Soil/Water): Soil

Sample ID: S-12A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q            | M   |
|-----------|--------------------------|---------------|---|--------------|-----|
| 7429-90-5 | Aluminum                 | 23,800        |   |              | P   |
| 7440-38-2 | Arsenic                  | 9.2           | J |              | H   |
| 7440-41-7 | Beryllium                | 2.5           |   |              | P   |
| 7440-43-9 | Cadmium                  | 49.2          |   |              | P   |
| 7440-47-3 | Chromium                 | 81.5          |   |              | P   |
| 7440-50-8 | Copper                   | 25            |   |              | P   |
| 7439-89-6 | Iron                     | 16,700        |   |              | P   |
| 7439-92-1 | Lead                     | 28            |   |              | F   |
| 7439-96-5 | Manganese                | 430           |   |              | P   |
| 7440-02-0 | Nickel                   | 38            |   |              | P   |
| 7440-09-7 | Potassium                | 5,800         | J |              | A   |
| 7782-49-2 | Selenium                 | 1.2           | J | <del>N</del> | H   |
| 7440-22-4 | Silver                   | 3             | J | <del>N</del> | P   |
| 7440-23-5 | Sodium                   | 500           |   |              | A   |
| 7440-62-2 | Vanadium                 | 126           |   |              | P   |
| 7440-66-6 | Zinc                     | 702           |   |              | P   |
|           | Fluoride                 | 40.5          |   |              | E   |
|           | Cation Exchange Capacity | 16.8          |   |              | A   |
|           | Nitrate/Nitrite as N     | 14            |   |              | ACR |
|           | pH                       | 6.7           |   |              | E   |

Cation Exchange Capacity is reported in meq/100 gm.

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 9/15/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121218

Matrix (Soil/Water): Soil

Sample ID: S-13A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q | M   |
|-----------|--------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum                 | 26,200        |   |   | P   |
| 7440-38-2 | Arsenic                  | 34            | J |   | H   |
| 7440-41-7 | Beryllium                | 3.7           |   |   | P   |
| 7440-43-9 | Cadmium                  | 153           |   |   | P   |
| 7440-47-3 | Chromium                 | 187           |   |   | P   |
| 7440-50-8 | Copper                   | 42            |   |   | P   |
| 7439-89-6 | Iron                     | 16,400        |   |   | P   |
| 7439-92-1 | Lead                     | 61            |   |   | F   |
| 7439-96-5 | Manganese                | 411           |   |   | P   |
| 7440-02-0 | Nickel                   | 60            |   |   | P   |
| 7440-09-7 | Potassium                | 8,000         | J |   | A   |
| 7782-49-2 | Selenium                 | 1.4           | J | X | H   |
| 7440-22-4 | Silver                   | 8.0           | J | X | P   |
| 7440-23-5 | Sodium                   | 1,370         |   |   | A   |
| 7440-62-2 | Vanadium                 | 371           |   |   | P   |
| 7440-66-6 | Zinc                     | 2,460         |   |   | P   |
|           | Fluoride                 | 102.6         |   |   | E   |
|           | Cation Exchange Capacity | 15.7          |   |   | A   |
|           | Nitrate/Nitrite as N     | 7.8           |   |   | ACR |
|           | pH                       | 6.9           |   |   | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*Handwritten:*  
3/5/92

# INORGANIC ANALYSIS DATA SHEET

Lab Name: Chen-Northern, Inc.

Sample No. 121219

Matrix (Soil/Water): Soil

Sample ID: S-14A

Level (Low/Med):

Date Received: 10/22/91

Solids: 100

Concentration Units (mg/l or mg/kg dry weight): mg/kg

| CAS NO.   | ANALYTE                  | CONCENTRATION | C | Q | M   |
|-----------|--------------------------|---------------|---|---|-----|
| 7429-90-5 | Aluminum                 | 15,400        |   |   | P   |
| 7440-38-2 | Arsenic                  | 22            | J |   | H   |
| 7440-41-7 | Beryllium                | 3.2           |   |   | P   |
| 7440-43-9 | Cadmium                  | 102           |   |   | P   |
| 7440-47-3 | Chromium                 | 141           |   |   | P   |
| 7440-50-8 | Copper                   | 35            |   |   | P   |
| 7439-89-6 | Iron                     | 10,200        |   |   | P   |
| 7439-92-1 | Lead                     | 38            |   |   | F   |
| 7439-96-5 | Manganese                | 170           |   |   | P   |
| 7440-02-0 | Nickel                   | 50            |   |   | P   |
| 7440-09-7 | Potassium                | 5,100         | J |   | A   |
| 7782-49-2 | Selenium                 | 2.0           | J | X | H   |
| 7440-22-4 | Silver                   | 6.0           | J | X | P   |
| 7440-23-5 | Sodium                   | 1,690         |   |   | A   |
| 7440-62-2 | Vanadium                 | 319           |   |   | P   |
| 7440-66-6 | Zinc                     | 1,570         |   |   | P   |
|           | Fluoride                 | 60.4          |   |   | E   |
|           | Cation Exchange Capacity | 8.4           |   |   | A   |
|           | Nitrate/Nitrite as N     | 7.8           |   |   | ACR |
|           | pH                       | 7.3           |   |   | E   |

Cation Exchange Capacity is reported in meq/100 gm.

*Handwritten:*  
12/15/92







































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































